REPORT RESUMES

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SYSTEMS APPROACH IN DEAF EDUCATION, SYMPOSIUM ON RESEARCH AND UTILIZATION OF EDUCATIONAL MEDIA FOR TEACHING THE DEAF (LINCOLN, NEBRASKA, APRIL 4-6, 1966).

BY- STEPP, ROBERT E.

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DESCRIPTORS- *EXCEPTIONAL CHILD EDUCATION, *AURALLY HANDICAPPED, *TEACHING METHODS, DEAF, INSTRUCTIONAL TECHNOLOGY, SYSTEMS CONCEPTS, LANGUAGE ARTS, OVERHEAD PROJECTORS, INSTRUCTIONAL FILMS, BOOKS, VISUAL LEARNING, AUDITORY PERCEPTION, TEACHING TECHNIQUES, INSTRUCTIONAL MEDIA, MEDIA RESEARCH, FILMS, AURAL LEARNING, HEARING AIDS, INSTRUCTIONAL MATERIALS,

PROCEEDINGS FROM THE 1966 SYMPOSIUM ON RESEARCH AND UTILIZATION OF EDUCATIONAL MEDIA FOR TEACHING THE DEAF INCLUDE KEYNOTE ADDRESSES AND DISCUSSION PAPERS. A SUMMARY OF THE CONFERENCE'S ACTIVITIES AND PURPOSES IS FOLLOWED BY ROBERT HEINICH'S EXPLANATION OF "APPLICATION OF SYSTEMS CONCEPTS TO INSTRUCTION." DISCUSSION PAPERS ON INSTRUCTIONAL SUBSYSTEMS (PROJECTED MATERIALS, PRINTED MATERIALS, AND ELECTRONIC RESOURCES) INCLUDE "SYNTHESIZING LANGUAGE ART SKILLS WITH THE OVERHEAD PROJECTOR" BY ALICE A. KENT, "8MM FILM AND THE EDUCATION OF HANDICAPPED CHILDREN" BY JOAN ROSENGREN FORSDALE, "THE LEARNER AND THE PRINTED PAGE--THE PLACE OF GRAPHICS IN A LEARNING SYSTEM" BY ADRIAN B. SANFORD, "THE AUDITORY CHANNEL IN THE EDUCATION OF DEAF CHILDREN" BY ROBERT FRISINA, AND "RATIONALE FOR DECISION--SELECTING THE RIGHT TOOL FOR THE JOB" BY ROBERT M. DIAMOND. S.N. POSTLETHWAIT'S DESCRIPTION OF "A MULTI-FACETED APPROACH TO TEACHING" IS FOLLOWED BY ROBERT J. SCHMITT'S DISCUSSION PAPER ON "A MULTI-MEDIA APPROACH IN THE CLASSROOM FOR THE DEAF." HARRIET GREEN KAPP'S ANALYSIS OF "APPLICATIONS OF SYSTEMS CONCEPT TO TEACHING THE DEAF" IS INCLUDED AND A SYMPOSIUM DISCUSSION SUMMARY IS PROVIDED BY MARIE FOCHT. BIOGRAPHIC INFORMATION PRECEDES EACH PAPER OR ADDRESS. BIBLIOGRAPHIES AND FIGURES ARE SOMETIMES GIVEN. APPENDIXES PRESENT THE CONFERENCE PROGRAM AND THE ROSTER OF ITS PARTICIPANTS. EXPLANATIONS OF THE LIBRARY SURVEY PROJECT AND THE EDUCATIONAL RESEARCH INFORMATION CENTER ARE APPENDED. THIS DOCUMENT IS THE AMERICAN ANNALS OF THE DEAF, 111(5)/596-703, NOVEMBER 1966. (JD)

SYMPOSIUM

on

Research and Utilization of Educational Media for Teaching the Deaf

"Systems Approach In Deaf Education"

National Conference

Sponsored by the

Department of Educational Administration

University of Nebraska

THE NEBRASKA CENTER FOR CONTINUING EDUCATION

LINCOLN, NEBRASKA

APRIL [illegible] TO 3, 1966

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Support for this Conference has been provided by a grant from Captioned Films for the Deaf, U. S. Office of Education, Department of Health, Education, and Welfare

FOREWORD

The second Symposium on Research and Utilization of Educational Media for Teaching the Deaf was held at the Nebraska Center for Continuing Education, University of Nebraska, Lincoln, Nebraska, April 4 to 6, 1966. The conference explored the theme: "Systems Approach in Deaf Education." The keynote addresses were given by Dr. Robert Heinich Dr. Sam Postlethwait, and Dr. Harriet Kopp. The conference is indebted to these individuals for the stimulating addresses that they presented.

The demonstration–discussion session presentations were made by Miss Alice Kent, Dr. Louis Forsdale, Mr. Adrian Sanford, Dr. Robert Frisina, Dr. Robert Diamond, and Mr. Robert Schmitt. These resource people not only gave superb demonstrations, but each also prepared a discussion paper for distribution prior to the conference. Special recognition is given to Joan Rosengren Forsdale for the paper on 8mm films. The participants were most grateful for the opportunity to study these papers in advance of the conference and then to have the opportunity to explore these topics with the authors.

Thanks and appreciation are also extended to the chairmen of the several sessions: Dr. Leo Connor, Mr. William Jackson, Mrs. Dorothy Beal, Mr. John Nace, Miss Alice Streng, Dr. Frank Withrow, Mr. J. Jay Farman, Mrs. Jane R. Birch, Dr. Marshall Hester, Dr. Edgar Lowell, Dr. Bjorn Karlsen, and Dr. Ray Jones. Special mention should be made of the contributions of the efficient conference staff: Dr. Joseph Giangreco and Dr. John Wiley, recorders; Mrs. Marie Focht, final report editor; Dr. Wilbur Wakefield, conference coordinator; and Mrs. Marcia Carlson, secretary.

The conference was supported by a grant from Captioned Films for the Deaf, U. S. Office of Education, Department of Health, Education and Welfare, Washington, D. C., in cooperation with the Department of Educational Administration, Teachers College, University of Nebraska. Considerable credit for the success of the conference should go to Dr. John Gough, Director, and to Mr. Gilbert Delgado and Miss Anita Carpenter of his staff, in the Washington office of Captioned Films for the Deaf. They deserve special praise for envisioning such a conference and giving it their personal and official support. Sixty educators from across the nation took advantage of the opportunity to participate in this program.

The discussion papers are reproduced in the order presented at the conference. The schedule of activities is reprinted in Appendix A. A roster of the participants may be found in Appendix B. The report of this conference, as was true for the 1965 Symposium, will appear in the November issue of the *American Annals of the Deaf.*

PROJECT DIRECTOR
Robert E. Stepp
Associate Professor
Department of Educational Administration
University of Nebraska
Lincoln, Nebraska

Robert E. Stepp, Ph.D., Associate Professor in Educational Administration, Teachers College; Assistant Director, University Extension Division; and Head, Bureau of Audiovisual Instruction, University of Nebraska, is Director of a project to develop and evaluate instructional materials for the deaf sponsored by Captioned Films for the Deaf, U. S. Office of Education. This symposium is one of the projects funded under this grant. He also directed a similar Research Symposium in the Spring of 1965.

Dr. Stepp has been conducting research in utilization of 8mm sound films to teach speechreading to deaf children. Articles describing this research may be found in the March 1966 issue of *Audiovisual Instruction* and the June 1966 issue of Volta Review. This study was financed by an N.D.E.A. Title VII grant from the U. S. Office of Education. Another N.D.E.A. program directed by Dr. Stepp was a Title XI Educational Media Institute conducted at the University of Nebraska during the 1965 summer session.

Dr. Stepp has been active in both state and national audiovisual organizations. He is currently a member of the Board of Directors of the Department of Audio Visual Instruction, N.E.A., and also a member of its executive committee. He is listed in the National Register of the Educational Researchers published by Phi Delta Kappa.

Dr. Stepp has a A.B. degree from Central College (Missouri), a M.A. from the State University of Iowa and his Ph.D. from the University of Nebraska.

Editor's Note: The following papers, Chapter I through Appendix B, were prepared for Symposium on Research and Utilization of Educational Media for Teaching the Deaf, April 4–6, 1966, Lincoln, Nebraska.

Sponsored by the Department of Educational Administration, Teachers College, University of Nebraska, and Captioned Films for the Deaf, Office of Education, Department of Health, Education, and Welfare, Washington, D. C.

CHAPTER I

INTRODUCTION

Today one reads frequently of the employment of the "systems approach" in solving a problem, or the formulation of a "systems concept" in planning a project, or the application of a "system development" in studying a particular situation. These terms are a product of our technological revolution, especially have we been influenced to think in these terms by our space program. As we sit in the comfort of our homes and watch the launching of a manned spacecraft into orbit, the happy words we expect to hear just prior to the launch are "all systems go." As the first crucial moments go by, the announcer tells us that the such and such system is functioning properly, or fired on time, separated as scheduled, or shut off as planned. What does this mean? It means that a series of component parts have been designed to function in a prescribed sequence to accomplish a predetermined objective.

Is it conceivable that education of the deaf can benefit from a systems approach to learning? Educating the deaf is already a "system," but in most instances it has not benefited from the analysis and synthesis that are associated with the systems approach.

The 1966 Symposium on Research and Utilization of Educational Media for Teaching the Deaf explored the application of the systems approach to teaching the hearing impaired. The general plan of the conference consisted of three major addresses and six demonstration-discussion sessions. In each of the latter cases, a treatise was distributed in advance of the session and the author was present at the conference to expand on his ideas, demonstrate his use of media, and to participate in the ensuing discussions. These addresses and papers comprise the major portion of this final report.

The conference was also structured to reveal the three main relationships that exist between the teacher and educational media. Simply stated, the teaching process could be analyzed in terms of the teacher's use of instructional materials: "the teacher without media," "the teacher with media," and "the teacher within media." It is difficult to envision a teacher of the deaf working without media. The lecture, a discussion, or a conversation, with the student receiving the message by speechreading, fingerspelling, or both, would qualify as a teaching act fitting this category. If the teacher's voice is amplified and the students are wearing headsets, the teaching act is now employing media. If the teacher is using objects, flash cards, or any of the many and varied types of learning resources, media are being utilized. There are times, of course, in the development of language skills when the student's ability to comprehend spoken discourse must be verified. The true test of his language competency is communicating with other people in a highly visual world but one which is predominantly orally structured. Communicating in the classroom without the use of media, although essential to the normal development of the child, often is more of a testing function than a teaching function. This relationship, "teacher without media," as important as it is, was not a topic at this conference.

The second element mentioned, "teacher with media," is one aspect of teaching the deaf which is undergoing considerable change at the moment. Considering the teaching-learning process as a complete system, the various teaching and learning acts essential to the child's intellectual development become the component parts to the system. Although a "system" can be broken down or analyzed in many ways, for the purpose of this conference the division was made in terms of sub-systems by types of media. Three such categories were identified:

Projected Materials—An Instructional Sub-system

Printed Materials—An Instructional Sub-system

Electronic Resources—An Instructional Sub-system

Each category contains a vast array of instructional materials, but each category also contains one or two specific types which have a potential for making a unique contribution to the education of the deaf student. It is the utilization of these resources that were discussed at the conference.

In the session on Projected Materials, Miss Alice Kent, Supervisor, Classes for Hearing Impaired Children, East Cleveland, discussed the topic, "Synthesizing Language Art Skills with the Overhead Projector." In addition to her paper and discussion, she gave an excellent demonstration of the use of transparencies in teaching language skills. Dr. Louis Forsdale, Director, Project in Communications, Teacher College, Columbia University, presented the other demonstration in this section. He gave an outstanding overview of the present stage of 8mm films in education. The discerning paper on 8mm films was written by Joan Rosengren Forsdale, Associate Director of the Project in Communications. As this paper reflects and as Dr. Forsdale demonstrated, the 8mm film is one medium which is uniquely suited to teaching the deaf.

The presentation on Printed Materials was made by Mr. Adrian Sanford, President, Educational Development Corporation, Palo Alto, California. His topic was "The Learner and the Printed Page—The Place of Graphics in a Learning System." He stressed the role of the learner in the learning process and the importance of positive associations in all independent learning acts. He demonstrated new forms of printed materials which will not only teach the relationships, facts, and concepts, but which will also develop reasoning and decision-making.

For the discussion of Electronic Resources, Dr. Robert Frisina, Dean, Graduate College, Gallaudet College, Washington, D. C., spoke on "The Auditory Channel in the Education of Deaf Children." Capitalizing on the residual hearing of the deaf person is one instructional area that requires constant attention. Dr. Frisina discussed the importance of a planned program, early diagnosis and evaluation, and research into effective channels for auditory stimulation. Dr. Robert M. Diamond, Director, Instructional Center, State University College, Fredonia, New York, presented the second paper on "A Rationale for Decision: Selecting the Right Tool for the Job." Dr. Diamond discussed the contribution of educational television to teaching the deaf and related this approach to the systems concept.

The culminating sessions of the series on the "teacher with media" was an actual demonstration, employing a wide range of educational media in teaching a specific unit to a group of deaf children. Mr. Robert Schmitt, Supervisor County-wide Day Hearing Classes, Houston Independent School District, Houston, Texas, is an inspired teacher of the deaf who understands the contributions of media to the teaching-learning processes. He employed the overhead projector as a language vehicle as well as visual graphic device; he used slides, filmstrips, and study prints in the pictorial medium, and both 16mm and 8mm films to give realism to the teaching situation. His constant involvement of the learner in this process developed a form of participation which engulfed the child, excited him, and stimulated him to be highly attentive for receptive language and eager to express himself. Mr. Schmitt had designed a curriculum unit as a miniature system to present pre-selected information in a manner planned to elicit from the children the types of responses most conducive to achieving the learning objective.

This leads to the third relationship, "the teacher within media." The opening address was given by Dr. Robert Heinich, Department of Instructional Technology, School of Education, University of Southern California, Los Angeles, California. In his speech he coined a new term or designation for the "teacher within the media." He identified this teacher as being the "mediated teacher." An example of a "mediated teacher" familiar to everyone would be the television teacher; another would be the film teacher in a complete physics, chemistry, or mathematics series; or a third reference could be made to a programmed learning sequence for which the author is a mediated teacher. Dr. Heinich expanded on this idea in his address and presented his philosophy of the systems approach to education.

Dr. Sam Postlethwait, Professor, Department of Biological Sciences, Purdue University, Lafayette, Indiana, discussed and demonstrated his method of teaching Botany at Purdue University. Dr. Postlethwait calls this method "A Multi-faceted Approach to Teaching Botany." This is another example of the "teacher within media" since the student pursues his laboratory study of Botany as an independent learner. His direction and guidance come from the tape recorder for which the senior instructor has prepared a straightforward verbal explanation to accompany each learning exercise. In addition to reading the paper printed in this publication, you may want to study a film report of this instructional method. The film is available from the Audiovisual Center, Purdue University, and is entitled "A Multi-faceted Approach to Teaching Botany."

The closing keynote address was given by Dr. Harriet Kopp, Principal, Detroit Day School for the Deaf, Detroit, Michigan. Her address was entitled "Applications of Systems Concept to Teaching the Deaf." She referred to the great strides made in the world of technology and urged deaf educators to take a new look at what technology can do for the deaf student. She further recommended that more efficient use be made of the deaf student's prime receptor—sight. She discussed the balance between group teaching, individualized instruction, and independent study. Dr. Kopp gave a sound warning that instrumentation or technology must remain the servant of the educator.

The "Systems Approach to Teaching the Deaf," if employed, will require a re-structuring of course content, the establishment of a new relationship between teacher and student, the formation of new standards and goals, and an involvement with educational media heretofore not envisioned. It is recognized and even accepted by some educators that the deaf child will achieve at a rate slower than his hearing peer. One factor contributing to this delayed development may be his dependence on other people for his education. Perhaps the salvation for the deaf child may rest within the child himself. What could he learn on his own if given the right opportunity, in the right environment, with the proper materials programmed to challenge him. The deaf child, like any child, should be limited only by his mental ability—not his acoustical handicap. The systems approach provides this type of opportunity to the deaf. The challenge is to the educator who must select, prescribe, guide, program, and evaluate the learning experience.

CHAPTER II

APPLICATION OF SYSTEMS CONCEPTS TO INSTRUCTION

by Robert Heinich, *Director*
Educational Media Specialist Institute
Instructional Technology Department
University of Southern California
Los Angeles, California

Dr. Robert Heinich, Assistant Professor of Education in the Department of Instructional Technology at the University of Southern California, received his B.A. and M.A. from Colorado State College and his Ph.D. from the University of Southern California. Dr. Heinich has acted as Director of the Department of Audio-Visual Services in Colorado Springs, Colorado. Previously he had been a visiting faculty member during summer sessions of the University of Southern California, Colorado College, The University of Colorado, and Western State College (Colorado). He was a Task Force member of Project TEAM (Teacher Education and Media) a Title VII grant to AACTE. Dr. Heinich has also served as Co-director and as Director of the Educational Media Specialist Institutes (Code 1) NDEA, Title XI at the University of Southern California.

Dr. Heinich is a member of several different professional organizations. He is a Past President of the Audio-Visual Department of the Colorado Education Association. He was the first President of the Colorado Audio-Visual Association. Dr. Heinich is also a member of the Professional Standards Committee of the Department of Audio-Visual Instruction of the NEA and has been a keynote speaker at DAVI National Conventions. His most recent publication is "The Systems Engineering of Education II: Applications of Systems Thinking to Instruction."

APPLICATION OF SYSTEMS CONCEPTS TO INSTRUCTION

All of the things I'm going to talk to you about actually have occurred. All I'm trying to do is identify certain characteristics which I think are going to become increasingly important, and which I think we had best pay attention to. In fact, all of the things that I'm going to talk to you about have come, in essence, from my own experience in the public schools and all of these things have functioned at one time or another in situations that I have been in contact with.

One time Robert Craft, the conductor and associate of Igor Stravinsky, asked Stravinsky what part theory plays in his compositions. Stravinsky replied, "Theory is hindsight." It occurs after the event. In this sense, theory that I'm presenting to you comes from and emerges from practice. Now in this sense too, we often look at research a little bit differently after it has occurred because the conditions change.

A piece of research conducted by Wes Meierhenry here at the University of Nebraska right after World War II was what I consider to be an example of operations research, which is the methodology of systems research. This study was concerned with extensive use of films in the social studies through entire courses. The question that was raised, and that I think is significant, particularly as I go through this presentation, was not really the question, "Can films teach?" Of course they can. The question that was really answered was, "Can you run a class this way?" In other words, can a class be managed by a combination of film and classroom teacher as partners and co-workers in an instructional enterprise? This was really the rationale of that research as we look at it today.

In this discussion, I am talking about instruction as a system rather than education as a system. Television, programmed instruction, audiovisual materials, logistical support problems, classroom teachers, etc., are sub-systems of this instructional system. I want to keep this simple by talking about fundamental relationships in this instruction system between certain components, particularly between mediated and classroom instruction.

Let me present a couple of definitions of systems:

> A system is the structure or organization of an orderly whole clearly showing the inter-relationships of the parts of each other to the whole itself. (Leonard C. Silvern)
>
> An operational system synthesizes and inter-relates the components of a process within a conceptual framework insuring continuous, orderly and effective progress toward a stated goal. (Heinich)

I hope that in the next few days these generalized statements will start breaking down into more meaningful parts.

In the latter definition I would like to emphasize "conceptual framework" because, as we will see, this determines how a process is structured. Silvern has flow charted his definition and I would like to go over it with you for two reasons. One, it introduces you to a technique of the systems approach: the flow chart method. And second, we can get a better picture of the systems approach from the diagram. (See Figure No. 1) The structure that we are talking about in this definition is instruction. The relationship of the parts to each other and the parts to the whole is the section of the diagram that I am going to be concerned with in this paper. Now, what I am going to do is to show you that problems have arisen in the relationship between the parts to each other, in reference to media, tending to reorganize this system we call instruction.

There should be a distinct difference in your mind between the terms "system" as we sometimes use it, and a systems approach. A systems approach is a way of attacking a problem. A system may or may not have benefited from a systems approach. For example, our educational

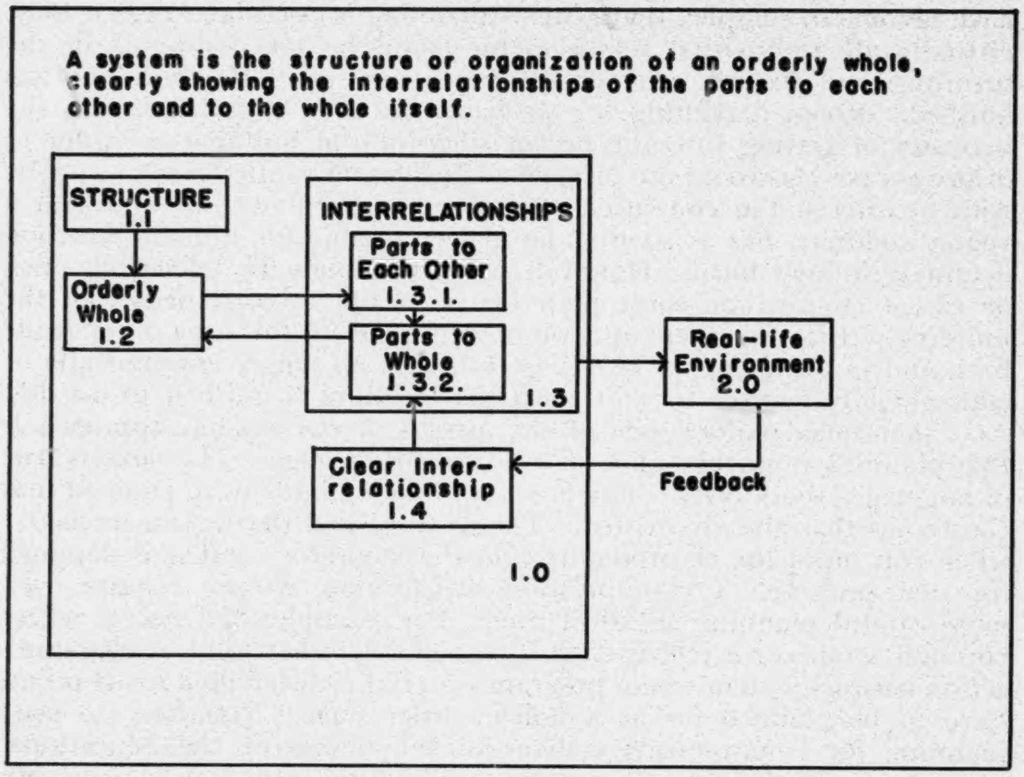

A system is the structure or organization of an orderly whole, clearly showing the interrelationships of the parts to each other and to the whole itself.
STRUCTURE 1.1
Orderly Whole 1.2
INTERRELATIONSHIPS
Parts to Each Other 1.3.1.
Parts to Whole 1.3.2.
1.3
Real-life Environment 2.0
Feedback
Clear Inter-relationship 1.4
1.0

FIGURE NO. 1

(from *Audiovisual Instruction,* May 1965)

system at the present time is a system that has not had the benefit of a systems approach in its planning. If there is one characteristic of a systems approach that is important above all others, it is that planning occurs very early in the formation of a system and at many levels simultaneously. This is extremely important because in education we tend to work on problems piecemeal. In order to use an approach of this kind, planning has to occur at a much earlier point in time and I'll show you how this has been taking place in certain newer media.

There are three steps in the systems approach. First, we have to go through a systems analysis, taking the system apart. Second, we re-synthesize the system, putting it back together in a more meaningful way. Third, a process called anasynthesis, which is the interaction between synthesis and analysis. Now, all of this occurs through a certain conceptual framework. In the next few days you will be hearing from people who will talk about sub-systems that will fit in different places in this structure that I'm going to talk about, and if I do a decent job you will be able to place those sub-systems in their respective niches.

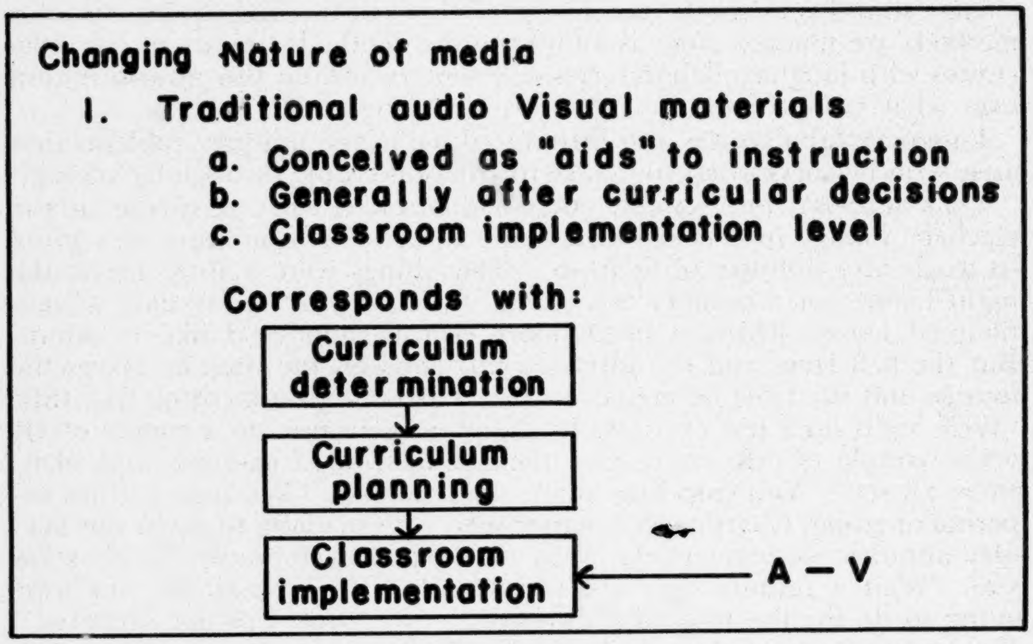
Another very typical fact about a systems approach is that we don't normally go out looking for it. It is forced upon us. As I said, theory emerges from practice. Practice changes and we are forced to reconstruct the way we look at things as a result. I want to talk to you about changes which have occurred in media forcing us to look at media in a different way.

Instrumentation problems associated with media (i.e., the hardware) have become so complex that systems planning is essential. Before 1953, virtually all audiovisual requirements could be taken care of in the furniture and fixtures part of capital outlay, *after* the building was finished. Room darkening was probably our first experience with the necessity of getting into the design stage of the building in order to insure proper classroom use of media. Incidentally, after many struggles with architects, I'm convinced that form *may* follow function with a young architect, but as soon as he makes a name for himself, function definitely follows form. However, when you plan for television, open or closed circuit, you must plan for it in the original design of the building. If it is open circuit, you have to plan for this on a system-wide basis and in a number of buildings, but it is no longer economically or educationally feasible to wait until the building is finished to do this. As I mentioned before, one of the aspects of the systems approach is that planning must take place at a much earlier stage. The same is true of language laboratories. The first ones that we built were jammed into classrooms that already existed. Then we learned that it is a lot better when you build the classroom around the laboratory and it is designed for that purpose. Communication distribution systems require even more careful planning ahead of time. For example, dial system where you dial a tape or a television program or any other kind of communication network system where program material is distributed to all points have to be planned for at a much earlier stage. You have to start planning for computerized systems in the design of the educational program of the district rather than as a building function because software and hardware combine into such an integral unit that separation is impossible.

Problems of cataloging, distribution, and storage have helped bring on the systems approach in media management because of the scope of the problems that are involved. In fact, we have a project going on at USC in which an automated film catalog for the entire southern California area is being put together. All of the county and school district libraries put their acquisitions on computer cards and tape. Anytime someone wants a copy of his library, push a button, chug it out and send it over. These problems have gotten so complex that the best way of handling them is in a tremendous system-wide basis.

Federal aid programs are pushing us into a systems approach. We know from other fields that a sufficient quantitative change results in a qualitative change. A very interesting qualitative change has resulted from all the federal aid programs to the public schools. Suddenly, instructional technology has become too important to leave to the instructional technologist. Now we get the superintendents rubbing their hands and saying, "Say, what is this new program, you know, with all the money." We are now getting people at much higher levels interested in instructional technology because of the tremendous amount of energy that has been put into the system.

However, what I really want to talk about is the drive toward the systems approach from two other main directions. One is the changing nature of media. Audiovisual materials, such as films, tape recordings, slides, overhead transparencies, were traditionally conceived as aids to instruction. They were not conceived as being self-contained instruction. They were also generally decided upon after curriculum decisions were made. In other words, the curriculum generally was determined, planned, and only then, when it went into operation in the classroom, we looked around for audiovisual materials we could use. Sometimes local production tended to break out of this mold by forcing us into curriculum planning for media, but in general the process operated in this fashion. In fact, we could represent it in flowchart form. (See Figure No, 2)



Changing Nature of media

1. Traditional audio Visual materials
   - a. Conceived as "aids" to instruction
   - b. Generally after curricular decisions
   - c. Classroom implementation level

Corresponds with:

FIGURE NO. 2

These breakdowns are necessarily very gross, but I'll risk over-simplification for clarity. After the curriculum has been determined (what it is we are going to teach), methodological decisions are made and assignments made to teachers, and then finally we get down to actual classroom implementation, where traditional audiovisual materials enter the process.

Now, this was due to change, and one of the first changes was television. When we started using television, decisions had to be made at a much higher level. For example, decisions determining instructional goals, what it is we want to accomplish by teaching with television, selection of studio teachers, arrangement of an orderly sequence of instructional events, creation of a climate of acceptance, and then, of course, measurement of the objectives we wanted to attain. All of this was built into using television as instruction in the planning stage.

Another aspect of this change was filmed courses which were byproducts of television. For example, the Harvey White Physics Course, the John Baxter Course in Chemistry, and the Humanities Series originated as television programs and changed our way of looking at the use of media in the classroom because here films no longer were regarded as supplementary, but as basic instruction.

I don't know how many of you might be familiar with the Rocky Mountain Area Project for small high schools, but in these programs important ground breaking procedures were developed in coordinating mediated and classroom instruction. Media in the form of filmed courses were used to present the bulk of instruction in physics, chemistry and the humanities, in a joint effort between the classroom teacher and those teachers represented in a mediated form.

Language laboratories emphasized to a number of audiovisual directors and teachers alike the problems inherent in the preparation of materials for instruction at the local level. Teachers found out, too, that when you change stimulus methods you change methods of teaching: print stimulus methods are not the same as audiostimulus methods. Some of our difficulties with language laboratories still centers around this misconception over what kind of stimulus materials are being used.

Language laboratories also introduced me to the unique problems that arise with teachers when you make instruction visible through technology.

Let's suppose, for example, that a Spanish teacher is sitting in the teachers' lounge in between classes and in about two minutes he's going to teach fifty minutes of Spanish. Now things were a little hectic the night before for a number of reasons and he doesn't really have a well-planned lesson, which is much more typical than we'd like to admit. But the bell rings and the forty seconds between the time he leaves the lounge and the time he arrives in the classroom go something like this: "Well, we'll do a few exercises in the preterite tense, do a couple of IR verbs, couple of AR verbs, give them a little drill exercise, and okay, we're all set." You stop him at the door and say, "We have a little experiment going, Charlie. No matter what you're going to do in the next fifty minutes, we want to do it via the language laboratory." He stops you, "Wait a minute, I'm not prepared." "Well, whatever you were going to do for the next fifty minutes . . . " "But, I'm not prepared." He was perfectly content to hold class for the next fifty minutes until you mentioned using the lab. He'll also say, "Well, I don't want to do it. My accent isn't good enough." "Well, Charlie, you've been teaching Spanish for ten years. It's been good enough up till now . . ." "Well, it's not good enough for this kind of thing." Technology raises questions about instructional quality that would otherwise remain hidden.

Another example is the television producer at a large university who told me last summer that he loses about two out of three instructors at the audition stage. When they saw the tape played back, they didn't want to face this visible instruction. Of course, these professors didn't quit teaching. They returned to a non-visible form of teaching. Technology makes instruction visible.

It also lets us know what the instruction is. One time I was previewing the first film in the John Baxter chemistry series with a science supervisor. The first film shows Baxter illustrating the six or seven divisions of chemistry with elaborate experiments, using a tremendous amount of equipment. A very effective presentation. When it was finished, I said, "Well, Fred, what do you think?" "Oh," he said, "really there was nothing there that a good chemistry teacher couldn't do." I said, "Fred, do you know any chemistry teachers doing it?" "No, no, I don't. But they could." In other words, we very often, in teaching, make the error that the input of the system is the same as the output. This is much more difficult to do when you're using technology. Now, this allows us, and this is one of the reasons why I'm mentioning it, to criticize a presentation in mediated form because it's on display in one form or another. We can view it, talk about it, and tear it apart. But the next time you do this, just think to yourself, do you *know* if the particular subject is being handled as well in all those classrooms. If preparation time contributes to the effectiveness of instruction, the television or film teacher has a great advantage.

Programmed instruction has been credited sometimes with introducing the systems concept in education. By analyzing and breaking down content into specific behaviors, devising the necessary steps to achieve them, setting up procedures to try out and revise the steps, and by validating the program, a small but effective self-instructional system was created—a technology of instruction.

I mentioned before that traditional audiovisual materials were *conceived* as "aids" to instruction. The media I have just discussed, however, are conceived as self-contained instruction. It makes all the difference in the world if you start from the premise that mediated instruction must be self-contained rather than from the premise that media are "aids." The changed perspective imposes an entirely different discipline on the process of incorporating instruction into mediated forms.

During this same period, the traditional audiovisual materials began to be treated in a more comprehensive fashion. In the middle 1950's educational film producers started releasing series of films which could and in many cases, *did* assume a major part of the instructional job. An example of this is the Planet Earth series based on the projects of the International Geophysical Year. Another is the Biology Program of EB Films.

Filmstrip-record sets expanded considerably, often incorporating large blocks of instruction. Both McGraw-Hill and EBF produced extensive filmstrip-record sets for elementary language programs. The SVE literature sets are also noteworthy efforts in this format.

A number of companies released comprehensive sets of overhead transparencies which were intended to form the backbones of appropriate courses. McGraw-Hill, Ozalid, Tweedy, SRA and others have contributed outstanding sets of overhead transparencies in mechanical drawing, chemistry, biology, English grammar, etc.

In fact, in the area of languages, producers are now combining media integrated and articulated so thoroughly that to break haphazardly into the sequence as planned invites disaster. "La Familia Fernandez" is an example. The classroom teacher needs to work with the materials on a team basis.

Television, programmed instruction, language laboratories, and packages such as "La Familia Fernandez," unlike traditional audiovisual materials, must enter the system at the curriculum planning phase. (See Figure No. 3) The shift from the classroom implementation level to that of curriculum planning requires the use of a new term—here I have used instructional technology. Audiovisual as a designation of a group of materials and equipment is subsumed under instructional technology. As I mentioned earlier, a characteristic of the systems approach is that more comprehensive planning by a variety of people takes place at earlier stages in the design of the system.

But more important for our purpose, this diagram changes the conceptual framework of the instructional system. It now gives us two

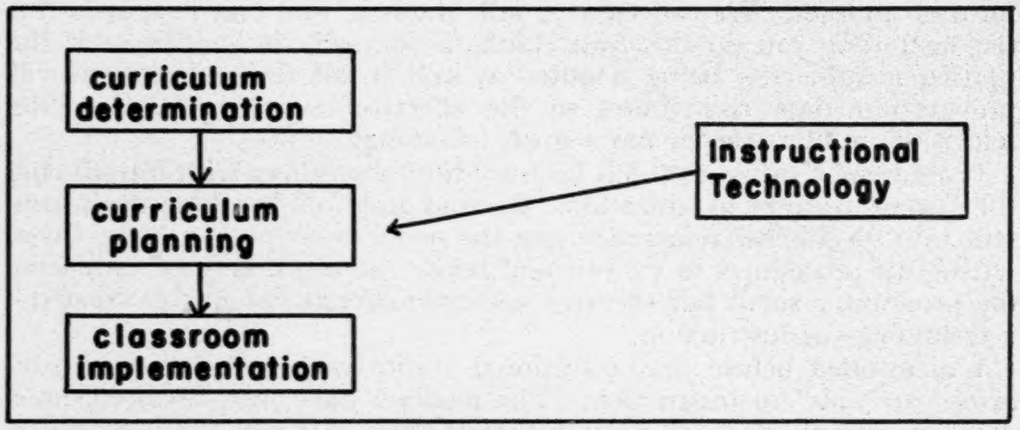

curriculum determination
curriculum planning
classroom implementation
Instructional Technology

FIGURE NO. 3

broad classifications of instructional activity whose assignments are made at the curriculum planning level: mediated instruction and classroom instruction. (See Figure No. 4)

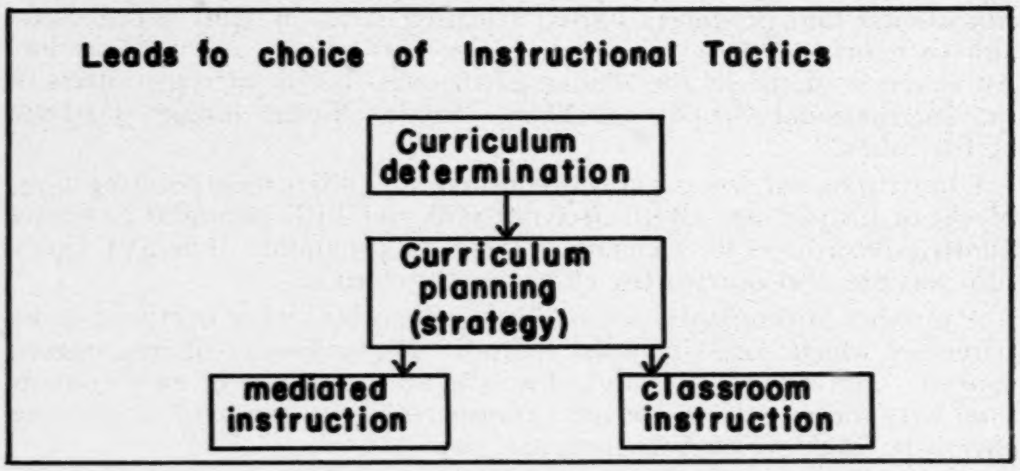

Leads to choice of Instructional Tactics
Curriculum determination
Curriculum planning (strategy)
mediated instruction
classroom instruction

FIGURE NO. 4

It follows that we must also distinguish between two sets of teachers. In television, we are forced to identify one group as studio teachers and the other as classroom teachers. Bob Stepp, in the March, 1966, issue of *Audiovisual Instruction,* talked about film teachers and classroom teachers. These labels can be generalized into a more useful differentiation: mediated teacher and classroom teacher. A teacher whose instructional efforts are presented to students via media is a mediated teacher. (Because of the peculiar time–space relationships involved, media teacher would be best used in reference to a teacher *intending* to incorporate his instructional activities in media form; and mediated teacher for one where the deed is assumed done.

The mediated teacher is *not* to be confused with a teacher *with* media. I'll come back to that in a moment.

I used television teaching and film teaching as examples, primarily because the instructional situations are more familiar and the relationships are more easily identified. However, once the point is accepted that instructional prerogatives are based on instructional assignments arrived at on the strategy level, the concept of the mediated teacher is applicable also to programmed instruction, language laboratories, and packages of materials.

The driving force behind the necessity of making this differentiation is that many instructional decisions, previously made at the classroom level, have been shifted to the curriculum planning level and are arrived at by teams which include both media teachers and classroom teachers as well as curriculum specialists and media specialists. At this level, courses are broken down and specific instructional assignments made—assignments to media teachers and classroom teachers. To put this in different terms, the curriculum planning level is the center of instructional strategy where decisions are made regarding the tactics of instruction. From a system point of view, mediated teaching and classroom teaching are simply different tactics used in the strategy of instruction.

The division of instruction into mediated and classroom permits three broad tactical choices. The first (See Figure No. 5) is the traditional practice where the classroom teacher has complete control over the media to be used in the classroom. This choice may be labeled teacher *with* media.

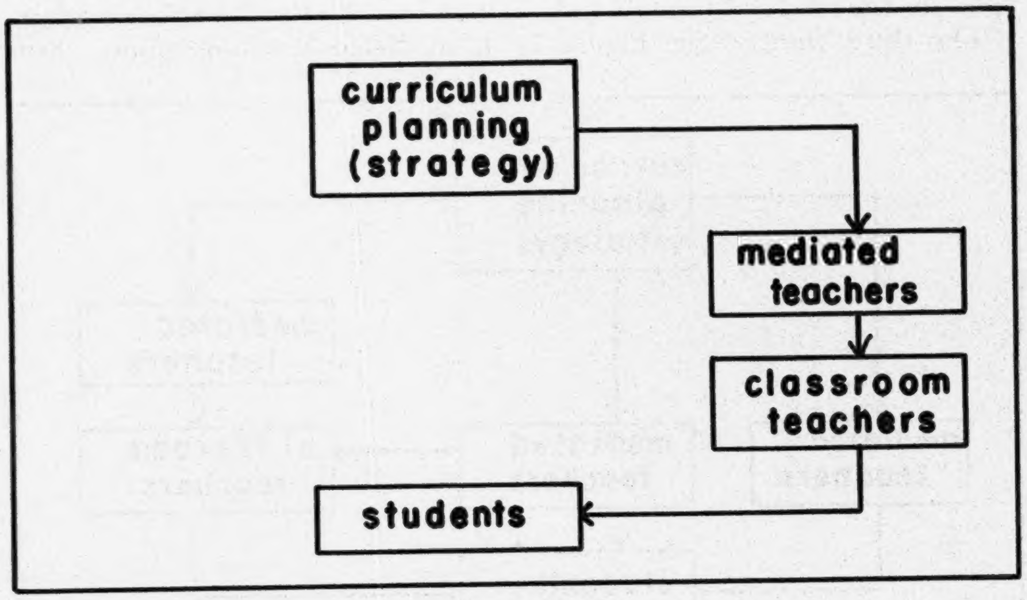


FIGURE NO. 5

The second option (See Figure No. 6) is the one that I believe will be most common: shared responsibility between mediated teachers and classroom teachers. The two horizontal arrows are intended to illustrate this cooperative enterprise. This arrangement permits the system to be adaptive. Notice, however, that the mediated teachers at the left do not go *through* classroom teachers. In other words, students have been assigned to those mediated teachers for part of the time and classroom teachers for part of the time. Team teaching, where one of the teachers is mediated, usually by television, is an example. The usual language

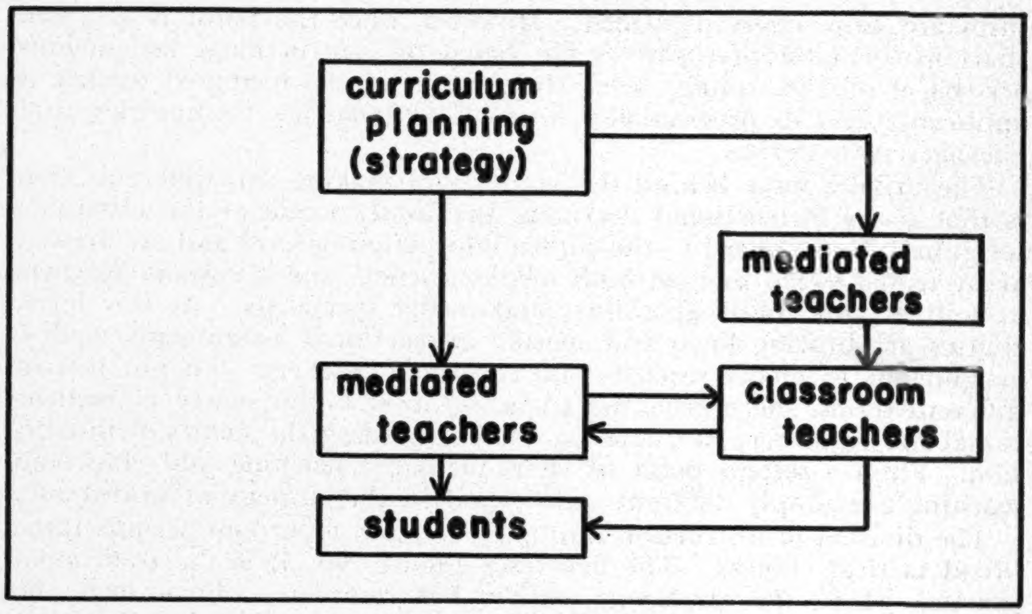

curriculum planning (strategy)
mediated teachers
mediated teachers
classroom teachers
students

FIGURE NO. 6

laboratory practices are another. Note that this arrangement still provides for use of certain media to be determined by the classroom teacher.

The third choice (See Figure 7) is mediated teaching alone. Programmed instruction often fits this category, as can television.

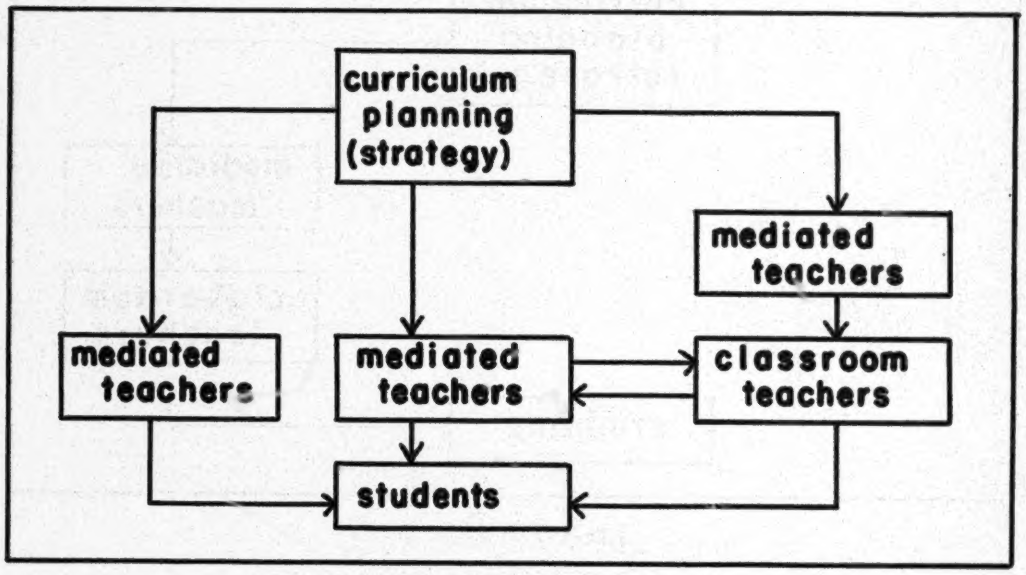

curriculum planning (strategy)
mediated teachers
mediated teachers
mediated teachers
classroom teachers
students

FIGURE NO. 7

I walked into a high school in Redondo Beach, California, one night and found a Mr. Silvius conducting an adult education class. There were 25 people in the room taking five different courses in mathematics. Mr. Silvius was in the front of the room working at his desk. The students were using programmed instruction. Now, he told me that before he started the programmed mathematics technique, this particular school had never had enough students to form even one class in one of those subjects. But by using programs in five different areas, he was able to teach five different math courses at the same time. Obviously, *he* wasn't teaching alone. He had turned the bulk of the instruction over to mediated teachers: to people who had prepared those programs and he was there to assist the students. Every now and then he would hold group sessions on mathematical reasoning. But the arrangement is a different relationship between teacher and media and methods of instruction.

I would like to read a quote from Charles F. Hoban, who is probably the person in this field most aware of what has been happening to media. In an address to the American Association of Colleges of Teacher Education, Hoban said this:

> Thus, in these two concepts, one, the new media as primary instruction, and two, the control of learning by remote control of stimulus and response, lie the seeds or the sprouts of the major developments now evident in educational television and in programmed self-teaching. In forty years this concept of newer media in education has grown from one of a device for a lesson presentation to one of a complete system with remotely controlled instruction covering an entire course.

This is the range of choices we have available and we must start training teachers to function within this range. Now, I understand there is a teacher training aspect to the program of Captioned Films for the Deaf, so I would like to emphasize what we need in the future in the way of teachers. Programs of teacher preparation must provide for training in three major areas.

The first area concerns handling of media normally under the control of the classroom teacher. These skills are normally incorporated in standard media courses.

The second area deals with the management of instructional problems where mediated teachers and classroom teachers work together. This is the concept of shared responsibility which I developed as the second choice of instructional tactics. Every student in a pre-service program should be required to learn how to work *with* mediated teaching, particularly when student teaching. Television might very well be the best of the media to use although programmed instruction and media packages like PSSC should also be used. He should work with whatever is most typical of his subject matter field.

Pre-service teacher training should make sure that the student has an opportunity to develop skills on both strategic and tactical levels. He must participate in curriculum planning as well as in working with mediated teaching in the classroom. In this way he will develop an operational understanding of the professional prerogatives associated with strategic and tactical assignments as well as acquire skills in analyzing content in terms of mediated classroom teaching.

The last area to deal with is the toughest but, to me, potentially the most important. Every student in pre-service training should be required to teach a substantial piece of content in his major field in mediated form. He must specify the terminal behaviors he wants the pupils to acquire and develop mediated instruction to achieve them. He must go through try-out and revision exercises to make sure the instruction does the job. At the end he would be required to test the students to make sure the terminal behaviors were achieved. This takes a tremendous amount of skill, knowledge and discipline. The mediated instruction developed here will not be conceived as "aids" but as "self-contained teaching devices."

Those who are interested by this experience may go on later to develop into media teachers. In this way I think we can better anticipate the needs of the future.

The other force pushing us into a systems approach primarily concerns the academic disciplines on the national level. To use systems terminology, we have problems of overloaded input caused principally by the growth of knowledge. It is a truism of systems that if input cannot be processed, the excess input is rejected. This is happening at the present time in the classroom. This is of great concern to people who are operating in a subject matter field on the national level. The accelerating rate of knowledge change means that it is extremely difficult for people to keep up with what is going on, and therefore decisions have to be made about what to leave in, what to change, that are very difficult to make on an every-day basis in a school. Also, the growth of available materials of instruction has gotten to the point where it is very difficult to pick and choose. And lastly, there are alternatives being created, as we have seen, to the classroom teacher as handler of the input. The response that has been made to this has been that the best way to keep students informed of the changing nature of knowledge and the best way to discard old knowledge and put in new is through well developed systems of materials developed by teams of scholars and teachers at the discipline level. The Physical Science Study Committee (PSSC) was the first such effort. PSSC has changed the teaching of physics in American high schools in five years. The success of PSSC has led to other programs in chemistry (CHEM study), biology (BSSC) and so on.

Jerome Bruner is moving toward a generalized theory based on the PSSC experiences as well as on his own research. In his latest book, "Toward a Theory of Instruction," which I would urge all of you to read, he discusses his efforts to re-do part of elementary school social studies. This whole movement is worth our attention because of the past successes of the people involved and the magnitude of the undertaking.

This flow-chart (See Figure No. 8) represents what I believe Bruner is working toward. The curriculum originates in the discipline concerned, with a large team composed of three types of people: subject-matter specialists, teachers, and psychologists (such as Bruner). When the curriculum is prepared, the expertise of these people is incorporated in media and other materials, including texts and suggested classroom activities. This whole package is then examined by local curriculum teams in the various school districts. At this point the decision is made to accept or not to accept—go or no go. This corresponds to the curriculum strategy level of our previous diagrams. If the decision is to accept, then classroom instruction and mediated instruction are set in motion in a joint enterprise as already outlined.

Bruner also provides for elaborate feedback loops to insure that the system will be adaptive: responsive to each level of operation so that changes may be made. (See Figure No. 9)

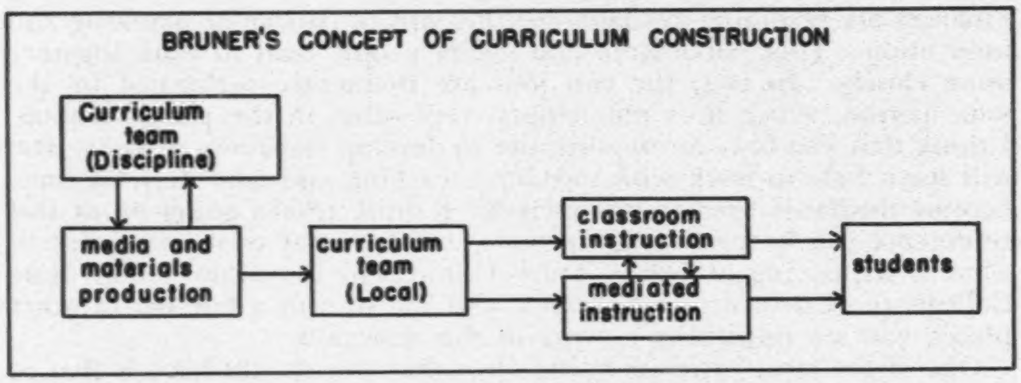

BRUNER'S CONCEPT OF CURRICULUM CONSTRUCTION
Curriculum team (Discipline)
media and materials production
curriculum team (Local)
classroom instruction
mediated instruction
students

FIGURE NO. 8

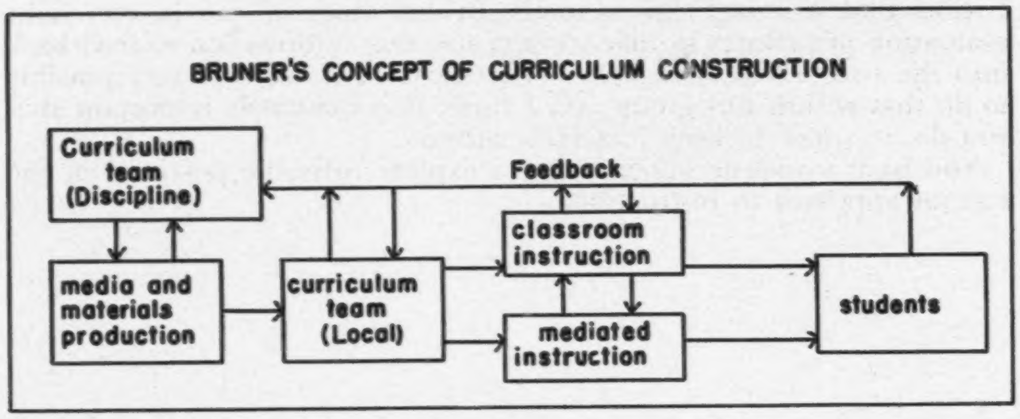

BRUNER'S CONCEPT OF CURRICULUM CONSTRUCTION
Curriculum team (Discipline)
Feedback
classroom instruction
media and materials production
curriculum team (Local)
students
mediated instruction

FIGURE NO. 9

He bases the necessity of using this approach on two premises: The classroom teacher cannot keep fully informed in subject matter while performing a full time job in the classroom; the second, and this is very provocative, is that classroom teachers, unfortunately, lack the necessary methodological skills to undertake a problem-solving apvroach. Bruner expects them to develop these skills, eventually, by following the models provided in the form of mediated instruction. This is an impressive testimonial to the potential of media for creative teaching.

Bruner's extension of the PSSC model is a systems approach to instruction made possible by well-developed technologies of instruction. While many educationists still wonder about whether or not technology is a good thing, the academic disciplines are using it as a prime means of resuming the dialogue between scholar, teacher and pupil.

I would like to conclude by drawing some implications for you as I see the problems you face. I think you are in a very good position to see if this process which I have talked about and that Bruner mentions in his book is a workable arrangement. I think you are in a much better position to do this than public education, as we commonly think of it. In the first place, you have a more closely knit system to work in. You get together with a higher percentage of your people more frequently and the ideas that need to be exchanged can be exchanged much more effectively. It's a tighter unit. You also have money to do it with now.

Finances are becoming available for this type of curricular planning and innovation. Your curriculum and media people tend to work together more closely. In fact, the two jobs are frequently performed by the same person, which does not happen very often in the public schools. I think that you have an opportunity to develop classroom teachers who will learn how to work with mediated teaching and who may, in time, become mediated teachers themselves. I think what's going on at this conference can be part of this process, and from my own knowledge of what is happening at USC's Tracy Clinic, San Fernando Valley State College, the University of Nebraska, and I'm sure in a number of other places, you are intuitively moving in this direction.

One of the most basic operating ideas that you should have is that as much as possible, where appropriate, the materials that you produce should be conceived as self-contained instruction and used on that basis. I think that you ought to, as in the Bruner diagram, put in very tight evaluation procedures so that you can use that information to feed back into the system and change it, if necessary. I think it is very possible to do that within this group and I think it is extremely important that you do, in order to keep materials current.

You have a unique opportunity to explore fully the potential of the systems approach to instruction.

CHAPTER III

SYNTHESIZING LANGUAGE ARTS SKILLS WITH THE OVERHEAD PROJECTOR

by Alice A. Kent, *Supervisor*

East Cleveland Classes for Hearing Impaired Children
East Cleveland, Ohio

Alice A. Kent has been Supervisor of the East Cleveland Classes for Hearing Impaired Children for fourteen years. Miss Kent is presently a member of the Board of Directors of the Alexander Graham Bell Association and has been Secretary of that organization since 1954. Miss Kent has had teaching experience at the Tennessee State School for the Deaf, Diamond Head School for the Deaf in Honolulu, the Clarke School for the Deaf and has also served as a demonstration teacher at Northwestern University. She has participated as a visiting professor at summer schools for teachers of the deaf at the University of Utah, Portland State College, Clarke School for the Deaf and the University of Virginia.

Miss Kent has attended the North Carolina School for the Deaf, Clarke School for the Deaf and Northwestern University. She received her Masters degree from Northwestern University in Audiology and Speech Correction.

SYNTHESIZING LANGUAGE ARTS SKILLS WITH THE OVERHEAD PROJECTOR

The fact that all studies of the educational achievement of deaf children have shown such a serious deficiency when compared with the achievement of children with normal hearing has made teachers of the deaf particularly sensitive to a quick appreciation for any effective method of improving and accelerating the development of the skills involved in communication. Overhead projectors have now been in daily use in each of East Cleveland's eleven classrooms for hearing impaired children for two years. This paper is an attempt to describe some of the ways the teachers have used these projectors with particular emphasis on a technique used in trying to synthesize the language arts skills of lipreading, writing, reading, listening, and speaking.

In any given classroom some children will excel in lipreading, some in reading, others may have better ability to understand language through their hearing and still others will seem to have more ability to derive meaning from words and the syntax of words. Our initial efforts toward using the overhead projector as an effective teaching tool were directed toward devising a technique that would help overcome these individual differences so as to enable teachers to instruct whole classes more effectively.

We wanted a technique that would serve to improve all of the receptive language arts skills for children who were ready to embark on an expansion of knowledge in different learning areas such as social studies, science, mathematics, and literature.

We wanted a technique that would improve the skills involved in expressive communication—writing good language, spelling, and speech.

We wanted a technique that would not penalize a child for errors in comprehension but would rather give each an opportunity to experience success according to his own ability.

And finally we wanted a technique that could provide practice for an entire class at one time, but at the same time allow each child to produce according to his own degree of ability.

The technique described below was at first tried with a class of ten-year-old children whose academic level was comparable to that of third grade in public school. All of the students were and still are unable to understand fluent speech through hearing without the addition of lipreading. Their intelligence ratings ranged from low average to superior. Their production of spontaneous language showed a wide variety of errors and abilities and also showed specific problems such as omissions of words and word endings and reversals in both spelling and word order.

The very structured routine procedure described here was followed in order to establish complete attention and successful participation by each child.

At first a practice period was given daily for a half hour using the overhead projector. The teacher prepared in advance brief news topics of general interest that would provide the children with something of interest to repeat to their families. The children used the group hearing aid and lipread simultaneously as our objective was to have them experience maximum success in comprehending.

Each child had on his desk a piece of paper and two well sharpened pencils with good erasers. The children were asked to fold their arms and not to pick up their pencils until the teacher had spoken a sentence.

The teacher spoke the first sentence of the topic once and the children wrote what they thought she had said. They then put down their pencils and folded their arms. The teacher then wrote the sentence on the overhead making sure that she held the pencil so that the children watched the point of the pencil forming each letter and word with good penmanship. If the children had errors on their papers they then picked up their pencils and corrected their own work, erasing if necessary. The teacher could see which children were having to erase for corrections but the child did not have to experience any of the hated red mark corrections on his paper. Then they put down their pencils and spoke the sentence twice using a soft voice. The teacher found that it was quite easy to call attention to individual speech errors as the children started speaking at different intervals when they had completed corrections in their written work. The teacher then repeated the sentence twice at a normal rate of speaking and finally the children spoke the sentence in unison with the teacher.

After the children began to show skill in the comprehension and production of news items, the subject material used for practice was taken from the social studies area that they were studying.

In addition to eliciting the participation of each child this technique has apparently encouraged longer spans of attention and sustained interest. It has been especially beneficial to children who had evidenced specific problems in spelling and word order in sentences. Children more skilled in the language arts are developing skill in note taking—so necessary if they are ever to realize success in classes with normally hearing children. Through this synthesizing of all of the language arts skills, teachers feel that there has been a marked increase in comprehension and a lessening of the gap between what pupils can understand and what they can produce.

From the third grade through sixth the children in East Cleveland's program have their school day divided into four parts and move to four different teachers. With an overhead projector in use by each of their teachers, the overall picture of attentiveness, comprehension, and sustained interest in all subject areas has shown marked improvement. Teachers have grown more skillful in reinforcing the comprehension of children whose visual perception is weak with a quick sketch or word definition on the overhead. With the teacher able to face her class at all times she is more quickly aware of expressions denoting puzzlement or lack of comprehension. As a result she is able to clarify meaning to a child before she has lost his attention.

While most teachers today are cognizant of the advances being made in programmed learning and teachers of the deaf are hopeful that through programmed learning the future in educating deaf children will be brighter, these programs and machines are still not available for universal adoption into many school programs for deaf children. However, in the interim, teachers are beginning to devise overhead projectuals built on the needs of their pupils and using the same structures and learning theories present in programmed learning units.

Projectuals clarifying the terminology encountered in social studies and building ability to interpret the symbols used in developing map study skills have been effective. Fifth grade children studying American history have been encouraged to make their own projectuals to use as illustrations in giving oral reports. Training elementary children to make their own projectuals can lead to providing them with a means of supplementing their presentation of reports required in many classes in secondary schools.

A look at the achievement scores of deaf children has generally shown higher scores in arithmetic computation than in other areas of learning. With the advent of the modern mathematics and the accompanying stress on seeing through the various processes, it has been necessary to teach the vocabulary of mathematics to very young children. Here again teachers are finding the overhead projectors a means of arriving at quicker and more lasting comprehension of the new materials. Pupils can more readily gain a concept of such words as groups, sets, combining, separating and rearranging when they actually manipulate small objects on the stage of the overhead to illustrate the desired action. Sketches to illustrate story problems bring real meaningfulness to the problems, especially when made by the pupils themselves. Fractions, geometric figures and all forms of measurement (linear, liquid, time and temperature) take on a greater depth of meaning when displayed on transparencies.

Language classes offer countless opportunities for creative use of the overhead. One of the most effective procedures has been in conjunction with a copying machine. Children's written compositions can be made into a transparency in seconds and corrected with an entire class participating. Motivation to create better and more interesting written work reaches a gratifying peak when a child is preparing a paper that he knows will be made into a transparency, to be thrown on the screen for the entire class to enjoy. Similar motivation is achieved by having children prepare transparencies at their desks on acetate sheets backed by a sheet of writing paper to help with spacing and using their own felt tip pens or wax pencils.

Speech improvement is accelerated when teachers employ the simple technique of using the point of a pencil to direct the class's attention to the desired rhythm accent and syllabification, or to call attention to a sound that needs to be articulated better.

The development of clear language concepts by pre-school deaf children has been greatly enhanced through the use of overhead projectors. For a class experience lesson the teacher may first prepare a projectual picturing the objects that will be used in the activity. Such a projectual is first used for association between the real and pictured objects and then for lipreading practice. Another projectual depicting the sequence of activities during the experience promotes the understanding of verbs and provides practice in lipreading sentences. Filed for future recall these projectuals have been valuable in later years after the children have attained enough language and vocabulary to enable them to give verbal expression to their memories.

In addition to projectuals built on actual class experiences, it is possible to devise a series of projectuals portraying in pictures some of the childhood classical stories. Deaf children can in this way be given mental appreciation of stories before they have developed sufficient vocabulary or skill in lipreading and reading to understand a story presented through words. The importance of providing children with lasting mental images in order to give them a mental foundation for the words they will encounter in reading can scarcely be overly emphasized. While much of this inner supply of pictorial foundation can be built through the use of filmstrips, T.V., movies, and actual experiences, the technique of capturing the highlights of a class activity on projectuals has been very effective when used for recall and reinforcement of learning through repetition.

Parent participation in the education of deaf children plays a very big part in most schools for hearing impaired children. Most parent groups have several deaf persons among their members. Overhead projectors used at meetings of these groups have enabled these deaf parents to participate much more actively in meetings. In the initial introduction of overhead projectors into each of our classrooms these deaf parents were quick to express enthusiastic appreciation of the potentials for improving classroom instruction and comprehension.

While no amount of teaching machines and tools will ever equal the value of a creative teacher, no other teaching device can challenge the ingenuity of a creative teacher more effectively than an overhead projector. Although it is very difficult to measure statistically the acquisition of linguistic competence, it is quite apparent that daily use of this technique can greatly facilitate the development and improvement of all skills involved in communication.

CHAPTER IV

8MM FILM AND THE EDUCATION OF HANDICAPPED CHILDREN

by Joan Rosengren Forsdale, *Associate Director*
Project in Communications
Teachers College, Columbia University

Joan Rosengren Forsdale, the author of this paper, is Vice President of a newly organized firm entitled Anathon Instructional Materials in New York City. This company is specializing in producing self-instructional films for industry and education. Mrs. Forsdale has a B.S. in English Literature from Columbia School of General Studies and received her M.A. from Teachers College, Columbia University. She studied film media at the Sorbonne in Paris and has served as a film consultant to the National Film Board of Canada. She has written extensively about films and was editor of the first newsletter devoted exclusively to 8mm films. This newsletter was circulated by the Project in Educational Communications of which she was Associate Director. Her most recent article on "Film Literacy," May issue, 1966, of the Teachers College Record, was co-authored with Dr. Louis Forsdale.

Louis Forsdale, Ed.D., Professor of English at Teachers College, Columbia University, specializes in communication studies. He is Principal Investigator of the Project in Educational Communication, Horace Mann-Lincoln Institute at Teachers College. The Project, which began in 1960, has centered on the implications of 8mm film for education, in which area Dr. Forsdale is recognized as a pioneer and national authority.

Professor Forsdale has an undergraduate degree from Colorado State College; his graduate degrees are from Teachers College, Columbia University. A staff member at Teachers College since 1946, Dr. Forsdale has also taught at Colorado State College and the University of Southern California. Two of Dr. Forsdale's publications about 8mm films which should be read by all are "8mm Sound Film and Education" and Chapter 8 in Matthew Mills' book on Innovation in Education. Dr. Forsdale gave the 8mm film demonstration at the Symposium.

8MM FILM AND THE EDUCATION OF HANDICAPPED CHILDREN

Why, when we are dealing with so general a topic as the education of handicapped children, do we specify *8mm* film? Why don't we just discuss the contribution that the motion picture medium can make? To leap over acres of talk about particular hardware, 8mm is specified because it can be used by the individual child unassisted, beginning at the kindergarten level. It can be used by him because some 8mm projectors are of the cartridge-load variety, which requires no threading. 8mm film is small enough to be placed in an inexpensive cartridge. While cartridges are available for 16mm projection, because of the quadruple mass and weight of 16mm and its double linear speed compared with 8mm, the cartridges themselves must be expensive machines.

The importance of 8mm to the handicapped, then, is merely a specially pertinent and powerful point within the attractiveness of 8mm film for a general school audience. The world of education now is extremely conscious of the importance of individual study for all students. For handicapped students this independence is even more desirable. Even to a complete non-expert in the special field of education for the handicapped, it is obvious that the handicapped child must be continually in a position of dependence on those about him. He must feel frustrated, and even angered, by the "patience" with which his needs for instruction are met. Machines, like books, are neither patient nor impatient. They do not patronize nor condescend to the learner.

And, too, because these 8mm cartridges play films in continuous loop form—unless programmed to stop at the end of a single run—they simply project the film indefinitely. If the film has been, as many of them can be, designed to be shown in this way, with no beginning or end titles, the student doesn't even know he is seeing the film for the second or third or fourth time until he has reached a level of partial recognition of its content.

There is no need to survey here the field of educational motion pictures to see what the medium has to offer. It has a great deal to offer, notwithstanding the fact that it offers less than it should and could. One of the gains to be hoped for with the changes in configuration of film use that 8mm brings is the chance it offers us to dislodge educational film from some of the unproductive snags on which much of it has long been caught, and to allow the medium to find its way into more satisfying channels.

What is "a change in configuration of film use"? The cartridge-loaded 8mm projectors are typically designed to be viewed in rear-screen fashion, that is, with the picture on the face of the box and not thrown onto a distant screen. The rear-screen presentation permits the viewer to move in close to the image and to respond to it in a way that much more resembles the intimate relationship between the reader and the medium of print. A rear screen, like television's, eliminates the necessity of pulling the blinds and turning off the lights. A small group has no difficulty in watching 8mm film in a normally lighted room. This change in configuration of use will, we hope, widen the break with the "Hollywood" tradition of educational film. These new films can be much more openly didactic, if didactic is what they should be, because one is not so tempted to compare them with the Hollywood product or its poor sisters in education. "Hollywood" tradition is used to suggest the irrelevant lushness of production values: the symphonic music under the opening titles; the standard glamorizing of the characters; the stock situations (the wise old neighbor or uncle who guides the golden-haired young'un in his quest for knowledge, "Let's see what it says over here about that, Billy."); in short, the masses of motivational gimmicks that surround, and often suffocate, the central instructional message.

Innumerable experiments have bolstered our common-sense assumption that the moving image has value as an instructional tool, whether presented through the medium of television or the motion picture. Certain kinds of information are clearly more economically conveyed in this way than through the medium of print (of course, the converse is true for other kinds of information); and as we all know, most children like to watch television and films. Part of their liking for these media probably derives from their not remembering a time when they were totally ignorant of the symbolic mode which these media use; they didn't have to come to the television set or film via the route of spending hours or days at someone's knee or behind a desk; they came to it seemingly by themselves, without having to wait for instruction or adult mediation. This sense of freedom is valuable to an ordinary child. How much more so to a handicapped one!

Here is a point at which the difference between film and television is striking: except under most unusual circumstances the child does not have control over what he sees on the television screen; 8mm, on the other hand, in a cartridge loop, is uniquely capable of being chosen by the child to be viewed whenever he wants to view it and looked at as many times as the child wishes, the loop playing over and over again. If this sort of control is important for any child, it is safe to assume that it must be especially so for the handicapped child, because he generally controls less of his environment.

In addition to the values of the medium as such, films are also valuable for the skills that they can teach, quite without regard to the medium they are taught in. What kinds of skills do we mean? Some of them on which experimental work is already underway are lipreading, fingerspelling, writing, calisthenics, and sports. It might be well to suggest here the gain to a handicapped child if he could see someone handicapped as he is displaying mastery of a necessary skill (for example, a child shown eating successfully with a prosthesis). I wonder if this would not help him to accept himself and his problem in a positive way?

Production of such tailor-made teaching films for an individual child or a small group of children is possible for even a technically inept adult. The new 8mm cameras, especially the cartridge-loading ones which have been appearing on the market in the last few months, are *really* "point and shoot" equipment. Any teacher or any parent could make films, with processing handled through the corner drugstore.

Until now 8mm film was typically used to make home movies. These homely products, available to the child in a cartridge loop, could be of great value to him for re-viewing a family outing which he may not have been able to take in fully when he experienced it in reality. For the handicapped child, this second or third or fourth chance to ingest a family experience must be very important. Too, filmed accounts of schools trips or ordinary school events—the distribution of juice, or milk and cookies, birthday parties for members of the class—available for re-view should intensify the feeling of belongingness and community, surely one of the things sorely in short supply for many a handicapped child. It also furnishes a simultaneous common experience for group discussion. The handicapped child's social world, one would guess, is emptier than that of the ordinary child. These films, which can be made by the children themselves as well as by teachers and parents, can help fill in with meaning, and also give the child a sense of pride and mastery. In addition to the locally produced films for the special audience, there are increasing numbers of both entertainment and instructional films available in 8mm cartridges; some sound, many silent. There are features and shorts and cartoons. There are, no doubt, advantages in both the specially prepared materials and in those which are designed for the general audience. One need not choose, but employ each where it seems most suitable.

As Marshall McLuhan, Director of the Center for Culture and Technology at the University of Toronto, has recently been making familiar to an ever widening audience, media may profitably be viewed as extensions of our senses. They give us more power over our environment, as do the more commonsense supplementers, such as binoculars or radar or headlights for everyone, and as do a hearing device, a leg brace, or eyeglasses for the handicapped. By, in their own way, increasing the amount of information available to us, the media enable us to exploit more fully the senses which work well for us, and help us to make the most of the senses whose strength is limited. Film, then, clearly has a place among the devices that we use to extend our control over our environment. 8mm makes it possible for any child to be on his own in learning from the moving image; it enables the handicapped child to do the same thing. Both the sameness and the independence are important to him. It puts him on his own in an area where he has never been able to be independent before. And on his own is where he needs and wants to be.

CHAPTER V

THE LEARNER AND THE PRINTED PAGE—THE PLACE OF GRAPHICS IN A LEARNING SYSTEM

by ADRIAN B. SANFORD, *President*
Educational Development Corporation
200 California Avenue, Palo Alto, California

Mr. Sanford is President of the firm he started in 1961, Educational Development Corporation (EDC) of Palo Alto, an outgrowth of his former business, Sanford Associates. He has also been a consultant for Holt, Rinehart and Winston, Science Research Associates, Harcourt, Brace and World, Life, Readers Digest and other publishers. During the years 1955–60, he served as representative and editor for the text department of Harcourt, Brace.

Before that, he taught elementary school, high school and college. He is a graduate of Columbia College and holds a Master's Degree from the same University.

He is the author of six books in the Spectrum Reading Comprehension series for elementary schools published by Macmillan. He holds patents for a number of educational materials, including games and self-instructional booklets.

His company has cooperated with Ginn and Company, Holt, Rinehart and Winston, The Macmillan Company, Scott Forseman, Prentice-Hall, Lane Publishing Company, Pitman Publishers, Fearon Publishers, The Center for the Gifted Child, and others in research and development of educational materials.

He is presently Secretary of the International Study Group for Mathematics Learning, a non-profit organization devoted to research in mathematics learning.

Mr. Sanford is listed in the 1964–65 edition of *Who's Who in California*.

THE LEARNER AND THE PRINTED PAGE—THE PLACE OF GRAPHICS IN A LEARNING SYSTEM

Within the complex system of learning, several subsystems may interact in a number of ways, changing in their usefulness and emphasis depending upon the nature of the learner, the subject being learned, the teacher and his techniques, and the materials being used. For example, one learner may be quite different from another in his attitudes and objectives as well as in his capabilities. These differences influence the effectiveness of materials in a learning situation. Sharply contrasting teaching techniques also affect the usefulness of learning materials. It is vital, then, to analyze closely the role of printed materials as a subsystem in an instructional program.

We can best understand the function of printed materials when we analyze them within a carefully defined context. This context includes other types of materials being used, the types of learners using them, the teachers involved in the learning experience, and the objectives of the latter two groups. Great care needs to be exercised in the specifying of the behavioral objectives.[1] With these objectives as criteria, we can measure learning. The question, then, is this: If learning is to occur, what kinds of materials are going to be most effective with what kinds of learners and teachers in what environment?

By directing our attention to the subsystem containing printed materials, in no way do we eliminate or downgrade the importance of other kinds of materials. Indeed, as can be readily seen by simple experimentation of learning sequences, materials in printed form usually *follow* other kinds of experiences with other kinds of materials. They also blend together, for instance in the case of the child whose learning consists of matching pictures to real objects and then words to these pictures or to the objects. In working with printed materials in beginning reading, it is essential to keep in mind the sequence of stages in learning:

1. experiences with the things of the actual world
2. experiences with reflections of things of the actual world (in most cases, pictures)
3. experiences with symbols representing those actual things, or their pictures.

Piaget[2] has enriched our knowledge of children's conceptual growth by showing that children move through stages of conceptual capability from birth to age 14. We need evidence of the effect of hearing impairment on a child's conceptual growth because the skills of reading are intricately involved.

The skill of reading printed words has assumed the utmost importance in our educational system. The first recorded research in the field of reading originated in Europe as early as 1844, when several psychologists determined the basic techniques employed by readers. Today there are in this country dozens of major government-supported research projects directed at determining the effectiveness and usefulness of reading methodology through psychological studies into the nature of the reading act. Unfortunately, the skill of the educator and the writer at putting together words in meaningful ways for the sake of the learner and his optimum sequences of learning has not been accorded the same attention as the skills of reading or the methods of teaching. For that matter, the configurations into which printed educational materials are placed and reproduced in mass quantity by means of high speed presses, have somehow missed being subjected to analysis anywhere near as exhaustive as those applied to the processes learners must undergo in order to interpret those printed materials. The work of Sir Cyril Burt[3] in England

and Miles Tinker[4] in this country stand alone in the literature. It is as though a few self-appointed architects and builders had got together and designed and constructed entire communities—homes, streets, public buildings, parks—without real regard for the kinds of people who are to live in them. Publishers of McGuffey Readers or the latest basal program operate in similar fashion. An author or team of authors writes down some materials; publishers with their artists and printers set these in type and reproduce the result by the thousands, or millions if the sales are that good, and it is up to the pupils to find their way through these materials—to live comfortably in these confines. The proliferation of new techniques and materials for teaching reading offers great variety. Noteworthy examples are:

1. developments in the use of color for underscoring phonemic consistency, as demonstrated in work at the John Tracy Clinic in Los Angeles and in Dr. Gattegno's *Words in Color* materials
2. the initial teaching alphabet which presents forty-four separate symbols for the forty-four sounds of our language
3. and linguistically oriented reading materials.

But these various techniques and materials may tend to confuse unless some overriding criteria can be postulated.

Even more perplexing is the fact that psychologists and linguists have opened up new controversy in the exploration of children's acquisition of language.[5]

Many linguists argue that a knowledge of the generative nature of the grammar of a language is essential to acquisition of skills in that language. This and related controversies must be resolved if materials and techniques for teaching language are to become fully effective.

For centuries mankind has given a disproportionate amount of time and effort to force-feeding text materials to children, without at the same time developing the sophisticated arts of preparing educational materials so that they are very palatable or digestible. It can be stated that the preparation of educational materials relates to learning as cooking does to eating. To carry this analogy one more step, some educators —having crammed down the throats of reluctant learners these indigestible lessons—compel their students to regurgitate the lessons on demand as proof that something has happened. No wonder that at first so many children are bewildered by what they see, then fail to relate readily to the materials, and finally grow to dislike textual materials.

From early years with most traditional texts, children find that their pages drone out a dreadful line—an implicit statement, "If you can't succeed in understanding what is on these pages, you are a failure."

Perhaps it should be the other way around. Textual materials—more specifically, those who prepare textual materials—should say to themselves and their readers, "If you can't understand what is on these pages, I am a failure—or in the case of misapplication of these materials, your teacher is a failure."

In the enormously challenging task of teaching children with hearing impairment, it must sometimes be hard for the teacher to avoid wondering wherein he may be failing. If teachers have felt that way they can take heart in the fact that, except for the unusual case, those who have prepared the textual materials have probably failed every bit as much, if not more.

Let me offer citation. We have long been involved in preparing printed materials of instruction for elementary, high school, and college learners. Only now can we sense when materials, by themselves, will have a chance of succeeding to a certain degree with carefully specified learners in a controlled environment. Most of the time it has been, and often still is, guesswork.

Fortunately, today we are in possession of some relatively advanced techniques for programming materials. These techniques have grown out of certain well-grounded principles of learning, as well as from a knowledge of graphics and a few advanced technological processes now at our command.

The term "programming" needs definition. In its popular sense, programming means the ordering of printed materials following a system established by Professor Skinner or Dr. Crowder. A number of prescriptive rules govern the way in which information can be ordered. Frames must be short; the learner must respond frequently. Cueing, vanishing and other rules purportedly allow the learner to proceed at his own pace and know at each step how he is progressing. Programming that follows these systems we would spell with a capital *P*. Evidence abounds that such programming, when well written, has a salutary effect on defined learners—but so does good writing paralleling that programming. All of which may prove that through programming the writer is forced to present his material in orderly, lucid fashion—more readily grasped by the learner.

In truth, those of us who have long been engaged in programming find that we are better developers of instructional material because of the rigor demanded by these rules. But we are less inclined to believe that Programs with a capital *P* are necessarily the best modes through which learners can learn.[6]

Instead, we believe there are techniques of programming that cover far broader landscapes. This broader kind of programming we spell with a lower case *p*. It encompasses many kinds of presentations—and even kinds of materials and experiences—extending from sophisticated verbal configurations, through modern graphic techniques of illustration, on to models and realia and things that relate together to form a multisensory exposure, out of which some directed learning can grow. This kind of programming takes into account the types of learners, their interests and objectives, and the subject matter, as well as the teachers and the environment surrounding the learners. In this context, we attempt to program textual materials as a *subsystem for learning*.

In order to do this, we must analyze who the learners are, their special adequacies or weaknesses, and the nature of learning. For young children, whether with hearing impairment or not, develop peculiar techniques and strategies for learning. They will reject instruction or materials they see no use for; they will eagerly seek out instruction and materials that communicate with them and meet their needs.

A crucial point is that within a classroom reside huge powers for learning contained not just in the person of the teacher but in each pupil. To neglect these powers is to overlook the most extensive learning resource available in a class.

Programming (spelled with a small *p*) utilizes the learner himself as a teacher. This means that as the teacher can provide access to the materials, the pupil can begin to interact with the systems of learning and with the particular subsystems that happen to be most appropriate for his needs. In fact, the pupil may help devise parts of a subsystem for himself and for others.

Four years ago we launched into a study of beginning reading materials specifically thirty-one reading workbooks published by five major publishers, for sale and use in grades one, two, and three. We analyzed these workbooks from two points of view. First, we studied the scope and sequence of the content and the skills stressed. Among the thirty-one workbooks—which comprised perhaps 85% of the seatwork time of a majority of our nation's children—we found a rather uniform pattern in which certain consonants and short vowels were introduced singly in the preprimer, followed by additional consonants—all in initial position —then gradually, consonants in terminal positions. Later came long vowels, consonant digraphs and blends, double vowels, and irregulars. A few hundred sight words were introduced concurrently in the first half year of the first grade. Then new words were added and, with phonic skills, the child was to apply these to new words.

From a second point of view we analyzed behavioral patterns expected of the learners as they proceeded through the books. That is, we sought to determine what each learner was *doing* during his time of work with the workbooks, and consequently what he was expected to be able to do after he finished the textual materials. For all workbooks in grade one and the first half of grade two, responses by the learners consisted of:

1. underlining a choice to match a picture or word
2. circling an item from among several choices
3. or connecting with a line two items that belonged together.

Upon further analysis, we determined that, in the main, beginning reading workbooks were teaching behavioral responses of underlining, circling, and connecting with lines. Moreover, these books were "testing" pupils rather than offering them learning experiences. The distinction between learning and being tested is vital. To illustrate, if a pupil incorrectly underlines a choice or incorrectly connects two items, a picture and a phrase, he never knows of his error until the teacher gets around to correcting the work he has done. By that time, the learner may have forgotten what the presentation was about. We know immediate knowledge of results enhances learning. But with delays, learning is least likely to occur.

In our studies of the printed page, we queried children regarding their immediate perceptions. What does a beginning reader notice first on a page of pictures and words? Not surprisingly, we found children attend to pictures first and then to print. If this is generally so, the relation of picture to print becomes vital in early reading materials, especially since we want children to learn to read from left to right. Our analysis of beginning reading workbooks, however, disclosed that more than fifty per cent of the pages incorporated pictures at the right side. This caused the reader to look to the right first and then to swing his eyes to the left, tending to contravene the eye training prescribed.

In order to correct some of these and other difficulties, we programmed a set of self-instructional booklets that allow the learner to proceed largely as he would in a standard workbook, with the added features of being able to write actual letters and words and to determine for himself at each step how well he is progressing. First results from field research showed these to be most effective for certain specified objectives.

Further experimentation turned up additional means for programming beginning reading material, as well as material in arithmetic and other subjects in the curriculum. These means make use of printed materials and a few carefully structured objects. Essentially they are within the subsystem of printed programmed material. Unlike traditional printed material, they are largely self-instructional. They make use of the fact that the learner can sometimes be his own best teacher.

In brief, the procedure is as follows. As the learner proceeds through the material, he exposes a trial situation to himself. He then makes his choice based on his knowledge or on sheer guess. He then confirms for himself the degree of accuracy of his choice. At this time, he discovers an error on his part and further discovers what his incorrect choice would logically lead to. Moreover, he learns *privately*. And this becomes important in easing his tension that may have developed from habitual error-making and external correction. He repeats this procedure over material that becomes increasingly challenging, or covers a wider scope, or both.

In essence, this is what constitutes programming. In traditional reading workbook material, the pages seem to be saying, "Here are these and here are those. Now show which go together correctly."

By contrast, newly programmed materials say, "Here are these and here are those you already know. Try me a little further and I'll reveal to you more things based on what you know. Then I'll tell you privately whether you're on the right track. I think nine times out of ten you will find you are right."

New self-instructional means for developing mathematical concepts also have arisen from research into learning and the construction of subsystems of materials for learning. Very young children with physical handicaps of various kinds can now proceed in rewarding fashion through experiences involving printed and manipulative materials that reveal structure and pattern and order—the basis of mathematics. Piaget tells us that children follow stages of development in grappling with the world around them. These stages begin with multi-sensory experiences and proceed to more conceptual and intuitive stages only after structured experience and maturity. Recent evidence tends to indicate that specially programmed experiences can hasten the mathematical maturity of many children and can assist them in conceptualizing to the degree that permits them to advance in learning computational and other skills necessary for arithmetical literacy. Similar experiences, specially programmed, could be of value in educating the deaf. Research in this area should be initiated.

With a deep conviction in the capabilities of the human being as his own teacher as well as learner—whatever may be his handicaps—it is a trifle hard to resist adapting instructional techniques and materials to programming.

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CHAPTER VI

THE AUDITORY CHANNEL IN THE EDUCATION OF DEAF CHILDREN

by Robert Frisina, *Dean*
The Graduate School
Gallaudet College
Washington, D. C.

Dr. Robert Frisina is Dean of the Graduate School, Director of the Hearing and Speech Center, and Professor of Audiology at Gallaudet College. Besides these duties, Dr. Frisina also holds several special appointments including: Consultant in Audiology and Speech Pathology, Department of Maternal Health and Child Welfare, Department of Public Health; Chairman, Technical Committee, American Hearing Society; Member, Research Committee, Conference of Executives of American Schools for the Deaf; Consultant in Audiology, St. Elizabeths Hospital. He is also the author of numerous publications concerning deafness and is the Associate Editor of the *Journal of Speech and Hearing Research.*

Dr. Frisina received his undergraduate degree from Westminster College and his graduate degrees from Gallaudet College and Northwestern University. He has been an instructor at the Missouri School for the Deaf and at the Kendall School for the Deaf. He has also served as Assistant Professor of Audiology and Chief Clinician and Research Associate, Institute for Language Disorders in Children at Northwestern University. Dr. Frisina spent several months as a UNESCO consultant to the Department of Education, Hong Kong.

THE AUDITORY CHANNEL IN THE EDUCATION OF DEAF CHILDREN

Acoustic communication is the means through which the majority group in our society learns to deal with the English language. The long term struggle, on the part of deaf children and those who attempt to teach them, attests to the serious obstacles an impaired auditory system can impose on growing children.

The present symposium is concerned generally with research and utilization of education media for teaching the hearing impaired, and specifically with a consideration of "Systems Concepts in Deaf Education." The purpose of this paper, within the context of this symposium, is to deal in practical terms with the auditory channel as an instructional subsystem.

In order to consider the place of the auditory channel in the systems concept in the education of the hearing impaired, three fundamental factors will be discussed under the following headings:

1. Subsystem A–The Auditory System in Deaf Children
2. Subsystem B–The Electronic Hearing Aid (Acoustic Coupler)
3. Subsystem C–Application to Education for Deaf Children.

Subsystem A–The Auditory System in Deaf Children

The auditory channel, along with the other senses, exists as a subsystem to the central nervous system (CNS). The cochlea of the inner ear, for example, is to hearing as the retina of the eye is to vision. Both of these end organs make it possible for the brain to receive sensory data from the environment. Both serve to transfer different kinds of physical data into *electrical energy* that is common to both vision and hearing within the CNS. The inner ear and the retina code bits of information for transfer to the brain where data from the various sensory subsystems are collated, stored and retrieved. Both vision and hearing can be considered efficient "distance" senses in that each makes it possible for the individual to communicate in the immediate situation or remotely. The life space of an individual can be extended significantly as a result of these two sensory channels functioning normally. This comes as no surprise to those concerned with educational media nor to those involved in the education of deaf children; however, whenever either sight or hearing is impaired the size and quality of one's life space can be curtailed seriously. In the case of hearing impairment it is essential that a thorough understanding of the auditory residuum be achieved in order that an appropriate acoustic coupler be incorporated into the auditory system.

Variations in hearing impairment Detailed audiologic assessment of children requiring special education on the basis of deafness indicates great similarity in the location of the problems within the auditory mechanism. However, a wide variety of individual differences exist as to the extent and quality of the remaining hearing. The two major problems in most impaired auditory mechanisms are reduction in *auditory sensitivity* and reduction in the *ability to discriminate complex sounds* (such as speech) even when amplified. Another way of describing these is to think of the inner ear as somewhat similar to an amplifier or loudspeaker within a hi-fi system. If the loudspeaker is defective, the fidelity of the whole system is reduced. Speech coming through such a loudspeaker would be distorted and difficult to understand; music would lose much of its quality. An amplifier not working properly could render the speech or music partially audible or inaudible. In either site of the problem within the hi-fi set understanding of acoustic symbols could be reduced substantially.

Residual hearing Almost all deaf persons have some residual hearing, however slight it may be. A typical organized public or private educational program for deaf children in the United States includes an estimated 35–40% of students who can learn to understand a good deal of amplified speech through hearing alone. An additional 40%, even though primarily visually oriented, are likely to derive substantial benefit from use of conventional group and personal hearing aids so long as hearing is used in conjunction with vision.

Suprathreshold hearing Deaf persons also demonstrate variations in the physiology of hearing at suprathreshold levels. Some auditory mechanisms demonstrate a linear relationship between increased amplification and perception of speech. Others improve to a certain point, then, in spite of increased degrees of amplification, demonstrate progressively reduced efficiency in speech perception. In some cases of deafness the threshold of discomfort is reached sooner (at lower intensity levels) than in the non-impaired ear.

Auditory distortion Frequently children with inner ear deafness have a mismatch in the hearing of low as contrasted with high pitched tones. Characteristically, low frequency sounds are heard, whereas the mid-range and high pitch sounds are inaudible irrespective of amplitude. This unevenness in hearing loss from frequency (cps) to frequency results in acoustic distortion which is antithetical to high fidelity. Physiologically such persons can hear but not understand because inadequate bits of information are coded by the inner ear for transfer to the CNS for interpretation and linguistic applications. This kind of hearing can be particularly useful when employed as an adjunct to the visual system but does not generally satisfy the individual for linguistic purposes when used in isolation.

More will be said of this concept of acoustic fidelity which is important from two standpoints when talking about education of deaf children:

1. The nature and extent of the defective auditory channel of the person

2. and, the acoustic characteristics of the hearing aid itself.

One or two ears The two ears in man function in harmony, allowing him to make decisions concerning localization of environmental acoustic events and possibly to enhance perception of speech occurring within adverse listening situations. In essence the two independent (but integrated) channels from the ears to the brain provide the normal hearing person with stereophonic sound. Yet it is not uncommon in deaf children to find a difference between the two ears of a magnitude to be of negative functional significance. Thus the matter of monaural or binaural residual hearing is of some importance in the acoustic coupling system to be used in individual cases of deafness. In some cases of deafness different bits of information presented simultaneously to each ear can summate within the brain. This suggests that auditory stimulation emanating from a monaural or binaural amplification system and fed to two ears, each with different physiologic characteristics, might be more efficient than unilateral coupling.

The preceding brief description of the auditory mechanism attempted to delineate the following concepts:

1. The auditory mechanism consists of several components. The "electrical component" is first involved at the level of the inner ear.

It is the inner ear that is unique to audition as far as nerve function within the CNS is concerned. That is, the inner ear serves to transduce mechanical energy into electrical energy; as an encoding device it codes bits of auditory information into the auditory nerve which in turn transmits these impulses to the CNS where multisensory relationships are established at cortical and subcortical levels. Depending upon the conditions, these relationships may have a positive impact on the child.

2. Environmental acoustic data are of fundamental importance in the initial language learning on the part of hearing persons. Partial or total absence of auditory input in infants and children seriously threatens even growth and development of linguistic skills and subsequent related educational, personal, and social functioning. Accurate assessment of the auditory residuum is paramount in determining the optimum acoustic coupler and its role in the process of education.
3. Deaf children are not homogeneous in extent and kind of deafness. Almost all are expected to have some impairment in the cochlea of the inner ear and/or its associated auditory nerve. This results in distortion (e.g., frequency, amplitude, and intermodulation) which reduces the precision or clarity with which whole words and messages can be encoded for transmission to the brain. Supplemental information is thereby sought via the other sensory systems, hence the stress on multisensory data in *developing acoustic communication* in deaf children. When hearing deficits become increasingly severe the individual shifts to visual orientation in which case the role of audition becomes essentially one of supplementation.
4. Suprathreshold physiology of an impaired auditory channel does not necessarily match that of the non-impaired mechanism. In some cases distortion (within the defective ear) remains constant over a wide range of intensity levels, whereas, in others the extent of distortion increases as suprathreshold intensities are made stronger. This factor demands individual appraisal of the gain characteristics of hearing aids relative to the impaired auditory system of each child.
5. Monaural evaluation of hearing is a necessary precursor to selection of optimum amplification at any given point in time. This requires, too, that longitudinal reassessments relate to advances in measurement techniques as well as technologic advances in acoustic amplification devices.

Subsystem B—The Electronic Hearing Aid (Acoustic Coupler)

The normal auditory system in man is capable of working over a frequency range of approximately 20 cps to upwards of some 20,000 cps, over an intensity range of some 140 dB, and is capable of instantaneously utilizing small temporal differences within complex acoustic stimuli. The various kinds of sounds that occur in our environment can be classified essentially as speech, music, and natural and man-made noises.

The average frequency range of male and female voices speaking the English language extends from approximately 100 cps to 10,000 cps. The difference between the intensity of the faintest sound *th* (as in *th*aw) and the loudest speech sound aw (as in th*aw*) is approximately 30 dB. Theoretically the smallest range of hearing that can be tolerated for perception of speech is 20 dB. This 30 dB range, of course, would lie somewhere between the faint level of 0 dB and the intense level of 140 dB in the non-impaired hearing mechanism. Normally, the midpoint of the 30 dB range occurrs around the + 65 dB intensity level on the 0 — 140 dB scale.

Dynamic range Impaired ears do not function over the ideal dynamic range of 140 dB because they do not begin to hear at the 0 dB level. An individual might not begin to hear a particular sound until + 75 dB is reached (his threshold for that sound) which would leave him with an intensity range of 140 dB minus 75 dB or 65 dB. This is where a hearing aid comes in. In this case, the hearing aid takes sounds that this deaf person would not normally hear and tries to put them between the 75 dB and 140dB range of intensities. The size of the range between this individual's threshold (in this case 75 dB) and the maximum safe upper limit in normal and defective ears (140 dB) or the person's tolerance level, which might be lower than 140 dB, is called that person's dynamic range (in this case 65 dB; 140 minue 75 = 65 dB). The narrower or smaller the dynamic range becomes, the greater the hearing loss becomes, which results in a less faithful auditory system for transmitting environmental acoustic data to the brain. Fitting the amplified sound into the most effective level within a person's residual dynamic range is one of the fundamental aspects of hearing aid selection and use.

Frequency response The frequency range of average American English is roughly 100–10,000 cps, that for music is much broader and that for natural and man-made noises quite variable. However, hi-fi music becomes noticeably lacking in quality whenever the frequency range of the hi-fi set is reduced below approximately 100–13,000 cps. As most of us are aware, telephone communication drastically alters the quality of music; it also changes the certainty with which proper names and unfamiliar terms can be transmitted via the telephone. For reference purposes, the frequency response of our telephone transmission system in use today is approximately 300 cps to 3300–3600 cps.

The frequency response of the ear itself is seriously restricted in most children requiring special education on the basis of deafness. As mentioned earlier, the usual restriction comes from loss of function in the higher frequencies. Almost all educationally deaf children have some low frequency residuum.

Overview of a hearing aid No matter how hi-fi or complex an electronic hearing aid becomes, there are three stages common to each:

1. input stage
2. amplification stage
3. and, output stage.

The *input stage* includes such devices as microphone, phonograph, tape recorder, sound track from movie projector, TV receiver, AM-FM radio tuners, etc. The *amplification stage* includes vacuum tubes and/or transistors that serve to increase the electrical energy received from the input sources. The *output stage* consists of such devices as a loudspeaker, earphone (sometimes referred to as a 6cc coupler and worn with a head band), and personal hearing aid insert receiver (referred to as a 2cc coupler because of its attachment to an ear mold inserted into the ear canal).

Each component within an electronic amplification system has its own peculiar way of handling frequency, intensity and time. The same questions asked of the impaired auditory system must be directed to the amplification devices considered for use in the education of the deaf. In the final analysis one must ask how much acoustic distortion is produced within the ear itself, how much distortion the amplification device coupled to the ear produces, and finally, how much distortion the overall system produces between the auditory stimulus initiated in the environment and the resultant information that arrives in coded form within the brain.

Types of hearing aids Hearing aids can be classified in a variety of ways, according to their portability, type of electronic circuitry used, frequency response characteristics, and point of placement of the aid on the body, to mention but a few.

Group hearing aids traditionally used since World War II have been of the nonportable wired type using close proximity microphones and headsets with earphones attached. From the standpoint of acoustic fidelity, this type has been of high quality. The typical system provides relatively flat amplification from approximately 100–6000 cps. The chief limitation in frequency response in this type of group aid has been the earphone. It should be understood, however, that 100–6000 cps is quite adequate for handling speech signals, particularly in view of the low distortion present in this type of unit. The drawbacks are not essentially acoustic in nature. The principal shortcoming of this type is the inflexibility of being "wired down" to the common transmission line feeding each of the control boxes into which the headsets are plugged. Any departure from this type of amplification system generally requires some reduction or compromise in acoustic fidelity; therefore, for purposes of this discussion the quality of the "wired down" can be used as a "standard" or frame of reference with which to compare the various types of hearing aids.

The original earphone cushion MX-41/AR used with the "standard" auditory training unit as described was found to be too uncomfortable for long periods of wear. Because of its shape, an additional problem called auditory feedback became fairly prominent. Plastic and foam rubber have been substituted in attempts to achieve more comfort and a better acoustic seal (to prevent feedback). However, a slight problem exists when the cavity of the earphone cushion becomes larger than that of the MX-41/AR; the total acoustic pressure delivered at the ear drum of the person is likely to be on the order of 10–12 dB less by changing from the MX-41/AR to a larger, more comfortable plastic or foam rubber type.

The problem of comfort with the MX-41/AR cushion leads in some cases to the substitution of an insert receiver (hearing aid type) for the standard earphone worn on a headband. This practice altered the "standard" frequency response characteristics of the auditory training units by reducing the frequency range and increasing the amount of acoustic distortion.

Attempts to "unwire" the teacher, and provide an input for students, led to the use of *microphones* hung from ceilings, attached to walls, or held by floor stands. Although the microphones were of similar acoustic quality to the standard, they operated over a 360 degree range, picking up unwanted ambient noises. In addition, it was known that the power output of the unit decreased with distance from the microphone. Of greater consequence, it was learned that greater amounts of distortion occurred as the distance of sound source from microphone increased.

A more recent approach to "freeing" the teacher has been through the use of *wireless microphones*. With this type a lapel microphone pack includes an AM or FM transmitter (to the basic auditory training unit). Properly selected wireless microphones provide quality comparable to the wired-type microphone, although at much greater cost at this time. Interference from commercial and other broadcasting stations frequently occurs but can be eliminated by taking certain actions.

The desire to provide more freedom and flexibility of movement on the part of the student led to the development of *loop systems*. The earliest models used the inductance loop principle. More recently, radio frequency loops have been developed. Properly developed and installed loop systems have the potential for matching in acoustic fidelity the wired auditory training unit.

Commercially available individual hearing aids have been in common use since World War II. The market for which the manufacturers have routinely planned has been the individual who has developed a mild to moderate hearing impairment in adulthood. Wearable hearing aids are generally classified according to where (on the body) they are attached. *Behind-the-ear* hearing aids, as a rule, amplify only those sounds between 500 to 600 cps at the lower end and from 3000–4000 cps at the upper end. The typical 500–3500 cps frequency response range is much less than the 100–8000 cps available in the standard auditory training unit. *Eye-glass* hearing aids are similar in acoustic characteristics to the behind-the-ear models. *In-the-ear models* do not differ markedly from the two preceding types of personal hearing aids in frequency response but are appropriate for mild hearing loss cases only. The eye-glass and behind-the-ear models, rated as high, moderate, and low amplification, are designed for mild and moderate hearing losses. The *body-type* is still the principal choice for persons with severe and profound hearing losses. The quality constructed body aid amplifies sounds between roughly 350–3000 cps with a considerable amount of distortion.

The most recent development in body-type hearing aids has been in the direction of broadening the frequency response. Emphasis has been placed on reproducing frequencies as low as 100 cps. This so-called *low frequency hearing aid* is approaching the response characteristics of the standard auditory training unit. It should be emphasized in the case of the existing low-frequency hearing aid that its uniqueness lies primarily in its feature of portability. It is not a new kind of amplification in the education of the deaf.

On the horizon is the *transposer hearing aid*. This type will be different from existing group auditory training units and individual hearing aids. The aim in developing a transposer hearing aid is to displace downward (electronically), on the frequency scale, certain high frequency sounds in speech or all the speech sounds. The reason for this downward shift is to attempt to fit speech into the frequency range where the greatest amount of residual hearing is present in so many severe and profound hearing loss cases. The transposer aid is in the experimental stage at present in both group and wearable forms.

Subsystem C—Application to Education of Deaf Children

The highly developed brain in man, coupled with other critical physical features, makes it possible for him to develop and use highly intricate verbal languages. Until very recently it has been traditional in linguistics to consider speech and language as one and the same. The spoken acoustic symbol (speech) has served as the raw material for the linguist. According to his definition spoken acoustic symbols ordered according to certain rules was language; not so in the education of the deaf. It has been recognized from the earliest attempts to educate deaf children that methods of communication and language, although possessing some common features, need not be identical. Certainly speech and language need not be synonymous. What, then, is meant by language? For the purpose of this paper, language is defined as a system of conventionalized symbols having the purpose of communicating thought. Strictly speaking, a specific language could be verbal or nonverbal, although our major concern relates to verbal language, in which case verbal means a systematized set of words however communicated. Some of the methods of interpersonal communication that are of practical concern in the education of the deaf include:

1. Acoustic symbols: speech production and speech reception through hearing
2. Visual symbols: reading lips, reading printed materials, reading fingerspelling, reception of formalized sign language, production of writing, lip movements in the speech of a deaf speaker, fingerspelling, and conventionalized manual signs.

The concern of this paper is not with the whole of language development, but rather, with the role of the auditory channel as a subsystem in the language development of deaf children. A good deal of research from a variety of areas suggests that man's brain is so organized that it enables one to select information from the variety of stimuli impinging upon him at any given moment. As a rule, data from at least two or more sensory systems are being transmitted to the brain at any given moment during the waking state. The ability to attend and select one set of data and suppress others is part of normal functioning. If it were not so, an individual would be in the unfortunate state of being overwhelmed by incoming information with which he could not deal in a coherent fashion. Conversely, if the brain is forced to deal with minimal bits of sensory information, it appears to have the capacity for integrating different kinds of sensory data which it strives to assemble into a cohesive whole. The former condition of limited control might be characteristic of some children with central nervous system malfunction who are seen to be somewhat distractible and hyperactive. The latter situation appears to be characteristic of deaf children when they are in a situation in which they must rely on acoustic communication signals through the auditory channel alone, through lipreading alone, or through these two in combination.

In order to emphasize this point, let me restate the situation of the deaf child put forth in the preceding paragraph. At the beginning, the congenitally deaf child or those suffering early onset of deafness, having moderate, severe, or profound loss becomes heavily dependent upon his visual system as a means for keeping in touch with reality. If he were able to substitute the visual system for the auditory in an adequate manner he would not present the language problems he obviously does. Upon closer scrutiny, it is obvious that in the deaf infant we are talking about hearing acoustic signals, on the one hand, and on the other interpreting speech signals through lipreading. These visual data sent to the brain represent less than the total information spoken. The efficiency of lipreading as a coding technique for the brain is indicated by a considerable number of studies, to be about 40–50% efficiency for unselected speech materials. The auditory receptive speech discrimination ability in cases with moderate, severe, or profound deafness also is less than 100%. The speech discrimination capacity of these three differing degrees of hearing loss might range somewhere from as low as 0% to as high as 60 or 70%. Neither system, lipreading or hearing alone, enables the brain to receive the full linguistic message. This applies to the congenitally deaf person and to those whose hearing loss occurred any time after the normal age for the development of speech and language.

Bisensory stimulation studies, utilizing lipreading and amplified sound, clearly demonstrate significantly greater efficiency when the two sensory systems are used together than either alone. This has been consistently demonstrated with normal hearers lipreading and listening under experimental noise conditions and with deaf persons with hearing losses as great as 85–90 dB relative to the 1964 ISO reference level (see Frisina, 1963, for more detailed discussion of bisensory stimulation). The critical point to be understood in the consistent bisensory advantage is that neither sensory system, auditory or visual, coded the acoustic signals in an unambiguous manner for the brain. The end result of either or both was always less than 100% correct reception of the message.

The bisensory advantage does not always manifest itself. Whenever either system can code the message unambiguously for the brain apparently tends to choose one or the other and can do equally well with either. This is suggested in a study of paired associate learning (Graunke, 1959). An attempt was made to determine the rate at which a person could learn to associate pairs of words when presented in the printed form, spoken form, or when both forms were presented simultaneously. Deaf and hard of hearing children learned the task as quickly through vision alone as when the auditory and visual were presented simultaneously. Gaeth (1960) followed this with a more elaborate approach in 1960 and again more recently ( )E 1001). The results of his studies in paired associate learning demonstrated again that hearing children could learn the lists as quickly through vision alone, or auditory channels alone, as when both were used together. In hearing children the brain received 100% through printed words, 100% through auditory means (because they did not have hearing problems), so when the two were used together it apparently made a choice of two efficiently coded messages. The deaf subjects did as well on the visual printed as they did on the combined audio and visual presentation but those with moderately severe to profound (61 dB ASA and above) could not learn through the auditory system alone. The totality of these experimental data reinforces the notion that the application of the auditory channel in the education of deaf children is not necessarily a unitary phenomenon. The role of audition is somewhat dependent upon the learning task with which the deaf child is confronted. It is likely that his brain will work overtime to try to get a closure on pieces of information that do not carry 100% in one sensory subsystem, but when it can get 100% through a single system it is likely to choose that one and, in effect, suppress or relegate to a less important role the other data.

Consistency and constancy Keeping the factors and concepts presented earlier in mind, one can next move to consider actual implementation of the auditory channel within the systems concept. Maximizing the contribution residual hearing can make in a given case depends upon two concepts which I call consistency and constancy. Consistency relates to nonacoustic factors, whereas constancy relates specifically to acoustic characteristics of hearing aids. Whether or not hearing impaired children receive maximum utilization of residual hearing depends upon several nonacoustic factors. Some of these can be controlled easier than others. Nonetheless, the extent to which these are brought under control will be reflected in the positive contributions made by use of the auditory channel in communication, educational attainment, and personal and social adjustment. An understanding of the hearing loss and of the multiple reasons for hearing aids in deaf children on the part of parents is fundamental in carrying through the overall goals of auditory training. If the parents can understand and can follow through in keeping the aid in working order at all times, can provide interesting and worthwhile auditory stimulation at home, and can attach significance to the wearing of the hearing aid, the use of the auditory channel will be well on its way. Teachers must have the same kind of information about the hearing problem and enthusiasm for the hearing aid. Keeping the aid working at all times and providing practice in the perception of auditory stimuli are no less important to the teacher than the parent. Consistency in hearing aid use is essential to optimum auditory training.

Constancy as indicated refers to general acoustic characteristics of hearing aids. Every amplification device, whether personal or group, has some distortion in reproduction. Hence the acoustic fidelity of a hearing aid is a basic factor in selecting amplification devices. However, fidelity is not the only consideration in the selection of hearing aids. The extent to which an individual hearing aid maintains its original characteristics is of vital importance. Constancy of acoustic behavior of an aid and consistency in utilization are perhaps the two prime factors in achieving maximum returns from hearing aids once properly selected for an individual.

Mobility Mobility is another basic factor in selection and use of amplification devices. Portability and related ease in moving about freely in one's environment is a desirable feature to be included in hearing aids if the characteristics related to fidelity are not sacrificed unreasonably. The mobility factor is probably more critical at the nursery-kindergarten levels than may be true at levels above these. At this time the portability-fidelity factors have not been resolved. Some attempts at loop systems appear encouraging from the standpoint of mobility of the students. Initial cost and upkeep, spill over from one room to the next, and microphone cord to the teacher present another problem to be worked out. Comfort from the student's point of view raises the question of insert receivers versus earphones. Maintenance seems to be greater with insert receiver cords than earphone cords, although the latter are more comfortable. The acoustic characteristics of inserts are not as good as earphones and probably do not hold up as well. These factors do not exhaust the acoustic considerations that should be part of decisions concerning the selection and purchase of personal and group aids for application to the systems concept in education.

Electronic amplification in daily learning experiences The application of electronic auditory amplification devices in the education of the deaf began to flourish in the years immediately following World War II. Organized efforts in behalf of hearing impaired children since then have come to include auditory training equipment and methodology as essential in the overall educational program. Variations in methodology have been in evidence but there is no question that the availability and use of auditory amplification devices have been accepted as fundamental to daily teaching procedures.

In many instances the full potential of the auditory channel has not been exploited in the education of the deaf. Realizing less than optimum potential of residual hearing has resulted in part from:

1. limited application of knowledge concerning the auditory system in deaf children
2. limited familiarity with available electronic hearing aids
3. limited knowledge of advanced technology and resultant lack of experimentation
4. financial limitations that preclude many opportunities for applying new techniques outside a rigid experimental framework
5. the difficulty in dealing effectively with the varietal levels of interest and abilities of significant people in a given child's life inside and outside the specific academic day.

Significantly improved personal and social attainments on the part of deaf children in later adulthood could result simply from more effective manipulation of the variables suggested in these five points, in spite of the fact that this list is not intended as exhaustive even from the point of view of the auditory channel.

The auditory system in continuous education Continuous education from infancy to adulthood in the case of deaf children is at least as important as in nondeaf children. It could even be argued that it is more important in the case of the former. The importance of early detection, accurate assessment of deafness, and the initiation of an optimum program for child and parent cannot be overstated. The auditory channel requires early and appropriate selection of acoustic coupling. Systematic reassessment of the auditory system and hearing aid should be a routine part of the continuous educational program of each child, particularly in view of the changes indicated by new technology at any given point in time. The auditory needs of deaf children also change according to various developmental levels and accordingly require reevaluation and counseling relative to the auditory system and hearing aids.

Full-day use of auditory channel Nondeaf persons have the benefit of rather complete immersion in an auditory world. Much incidental learning in the case of hearing children thus proceeds in a continuous fashion. Most deaf children, at best, are receiving chunks and pieces of the auditory world. Such mundane, but nevertheless very significant, matters such as dead hearing aid batteries, broken hearing aid cords, defective earphones or insert receivers, and broken wires are among the daily intruders to consistency in use of the auditory channel. Correction of the maintenance problem alone, can make a real difference in the effectiveness of an auditory training program.

The link between home and school too frequently is weak. The link between the academic program and supplemental possibilities inherent in dormitory living is often not maximized. Educational media can provide the common meeting ground for the several important ingredients (or which the auditory channel is one) in the overall educational program. Not all, but many prepared visual materials that are common to school, dormitory, and home have an auditory counterpart that can be exploited. For example, movies designed strictly for fun can become more meaningful if the auditory channel is provided through the youngster's own hearing aid or linked electronically to the output of the projector itself. Home TV receivers can be tapped to feed directly to the individual's hearing aid via the aid's telephone coil and thus other environmental sounds are eliminated. Loop-type hearing aids can provide maximum mobility within a classroom, and for two-channel loop receivers the system could be used in the library, in individual study carrels, and auditorium.

For years some parents of deaf children have been successful in providing full-day amplification for their children. Unfortunately this has not occurred in enough cases to consider it routine. Hopefully, emphasis on and availability of visual devices for home and dormitory use might have a positive influence on the amount and kind of auditory stimulation received outside the classrooms.

The auditory channel in the development of certain language skills The reception of speech and production of speech are the initial language skills learned by non-deaf children. Later these skills lead into the added skills of reading and writing. Speech frequency wearable and group hearing aids have been employed in the development of speech and language in deaf children. The research results concerning unisensory versus multisensory learning of speech, speech reading, and reading remains somewhat equivocal at this time. The critical variable suggested early in this paper was the integrity with which the end organ (inner ear or retina) coded *verbal* information for transmission to the brain. It was suggested that if the subsystem of vision or hearing codes less than 100% of the information being conveyed, the brain of the receiver will attempt to use both types of sensory data in getting the message. However, if either system provides 100% of the verbal message to the brain the brain is likely to use one *or* the other and not rely upon both.

Auditory channel and reading Hofsteator (1959) clearly demonstrated that learning language and reading could be accomplished in a congeni tally deaf person without use of the auditory channel. Gates (1926) and Thompson (1927) many years ago demonstrated that deaf children could learn to read through a visual approach. More recently a controlled study by Roy, Schein and Frisina (1964) demonstrated that deaf children as young as 3 years of age could learn language through programmed visual materials. The proceedings of the Symposium on Research and Utilization of Educational Media for Teaching the Hearing Impaired held in Lincoln last year (Stepp, 1965) includes on-going research studies in the unisensory approach to reading and language development. The effectiveness of a unisensory approach to reading as compared with multisensory remains equivocal. In a study of silent reading supplemented with rich vocal response on the part of students, significant gains were noted in a relatively short time (Kopp, 1963). A pilot study based on linguistic principles reported by Woodward (1963) called attention to the possible link between "... written and spoken language, particularly where complex sentence structure is involved." Some approaches to reading as a language skill in deaf children have included:

1. a purely visual approach such as that characterized by Gates (1926), Thompson (1927), Hofsteator (1959) and Karlson (1965)
2. silent reading on the part of the student in the specific act of reading but coupled with language enrichment through multisensory stimulation in the accompanying student responses in class discussion (Kopp, 1963)
3. a program of reading and language learning based on oral reading.

Acoustic channel and speechreading The role of the acoustic channel in speechreading has been mentioned earlier (Frisina, 1963). When approached from a linguistic point of view, the addition of the acoustic channel increased efficiency from 44% to 85% (Woodward and Barber, 1960). Numbers and Hudgins (1948) reported an increase from 43% to 65% by adding the auditory channel in the case of deaf children. Hudgins (1953), in a study of auditory training with deaf children, reported similar gains. Similar results have been found with Gallaudet College deaf students in cases where the loss of hearing does not exceed 90 dB relative to the new international normal threshold.

Acoustic channel and speech production Speech, of course, is based on acoustic signals. Perceiving the speech of others and monitoring one's own voice through the auditory channel is the surest means for developing intelligible speech production. Hearing aids have great applicability in the development and shaping of a vocal output, particularly in those whose loss does not exceed 90 dB (Re 1964 ISO Standard). Experimental data specifically related to speech production and reduced hearing levels are not plentiful, but the results of a great deal of teaching experience and clinical practice have illustrated the role of hearing aids in speech development. An important point that might be made relative to educational media is the influence of group amplifiers (as well as individual) on the teaching of speech. Prior to wearable and group hearing aids of the electronic type, the task of teaching speech to deaf children was necessarily done on an individual teaching basis. Since the majority of children requiring special education on the basis of deafness can benefit to some degree from amplified sound, incorporating the auditory channel in educational media carries with it the possibility of enhancing speech production even more.

The acoustic channel in independent study The role of audition in individual study in the clasroom, library, dormitory, and home can best be determined by knowing the task to which the child addresses himself independently. It is possible that the applicability of programmed instructional techniques is of relatively greater importance to deaf than hearing children. Because the development of linguistic skills in deaf children demands more intensive individual and small group attention, best use of every child's academic day is not likely to be achieved since the teacher must divide his time among the class, particularly for speech development and speech correction. Furthermore, efforts must be made to compensate for the extreme loss of incidental learning opportunities imposed on the deaf child. Programs of the type presently being developed by Withrow (1965) and others, wherein auditory and visual supplements to teaching are being produced, appear to have real promise. The full gamut of audiovisual materials can be applied on an individual as well as group basis in the dormitory, at home, in the library, and in the classroom. Coupling the audio output of the projector, tape playback, or other source to the individual's hearing aid, or providing a fixed auditory training amplifier for the individual presents no major problems.

In conclusion, it should be emphasized that in order for maximal educational benefits to accrue in each child, there must be assumed among other things an understanding of the auditory system of the deaf individual, an awareness of available auditory devices at a given point in time and knowledge of what is optimum for the individual's residual auditory potential, a critical analysis of the reason for pursuing each task included in the total educational program for each child, thereby determining the rationale for employing the auditory channel and quantification of results of different approaches in order to provide new directions in the use of media in the education of deaf children.

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CHAPTER VII

A RATIONALE FOR DECISION: SELECTING THE RIGHT TOOL FOR THE JOB

by Dr. Robert M. Diamond
Director of Instructional Resources
University College, University of Miami
Coral Gables, Florida

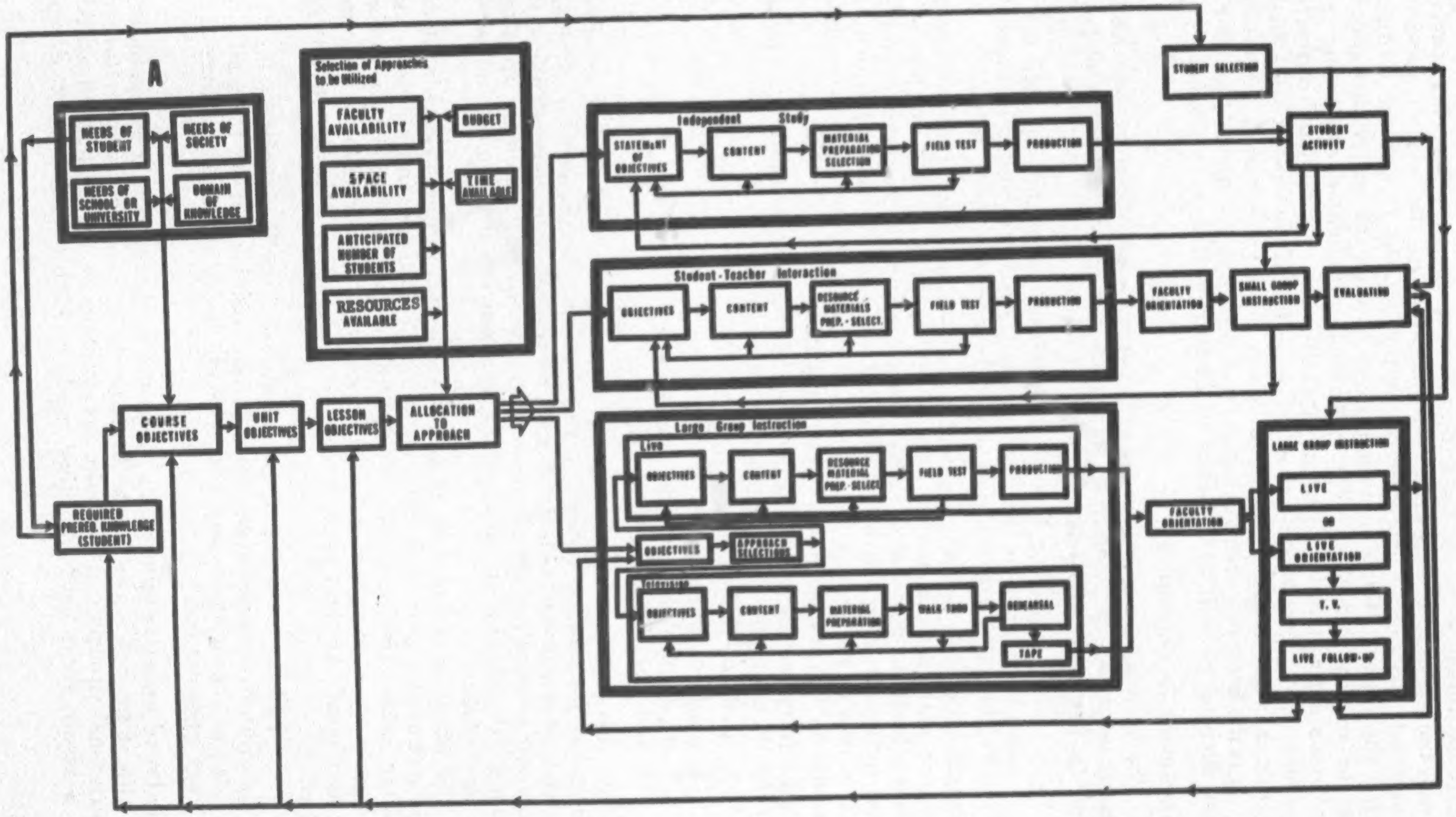
Dr. Robert M. Diamond is Director of the Instructional Center, State University College, Fredonia, N. Y. He was formerly Director of Instructional Resources at the University of Miami and worked under a grant from the Fund for the Advancement of Education aimed at evaluating and improving the instructional program at that insitution. A graduate of Union College, he received his Ph.D. from New York University in Educational Communications. Prior to coming to Miami, he was Associate Professor of Education at San Jose State College. In 1957 he was teacher-producer of a television mathematics enrichment series televised over WROD, Schenectady, New York, and later directed one of the first single school, closed-circuit projects. He is editor of A GUIDE TO INSTRUCTIONAL TELEVISION published by McGraw-Hill, has written numerous articles, and is co-author and illustrator of the first humorous programmed book for the general public, THE AMATEUR PSYCHOLOGIST'S DICTIONARY, which will be published this spring.

A RATIONALE FOR DECISION: SELECTING THE RIGHT TOOL FOR THE JOB

As we explore the potential of using the new instructional media for teaching the hearing impaired, some questions must be answered before any decision can be made as to which tool or technique will be most effective in solving a particular problem. By its very nature, a systems approach offers guidelines to follow—a *modus operandi*. A system provides the questions that must be asked and determines the proper sequence for asking them. It incorporates constant evaluation and feedback and, in effect, not only permits change but demands it. (One such system, designed as a procedure for course development, will be found in illustration 1.)

In working through the systems diagram it becomes apparent that long before a decision can be made concerning the use of one medium or a combination of several media, a series of fundamental questions

A SYSTEMS APPROACH TO COURSE DEVELOPMENT


A
NEEDS OF STUDENT
NEEDS OF SOCIETY
NEEDS OF SCHOOL OR UNIVERSITY
DOMAIN OF KNOWLEDGE
Selection of Approaches to be Utilized
FACULTY AVAILABILITY
BUDGET
SPACE AVAILABILITY
TIME AVAILABLE
ANTICIPATED NUMBER OF STUDENTS
RESOURCES AVAILABLE
COURSE OBJECTIVES
UNIT OBJECTIVES
LESSON OBJECTIVES
ALLOCATION TO APPROACH
REQUIRED PREREQ. KNOWLEDGE (STUDENT)
Independent Study
STATEMENT OF OBJECTIVES
CONTENT
MATERIAL PREPARATION SELECTION
FIELD TEST
PRODUCTION
Student-Teacher Interaction
OBJECTIVES
CONTENT
RESOURCE MATERIALS PREP. - SELECT.
FIELD TEST
PRODUCTION
Large Group Instruction
Live
OBJECTIVES
CONTENT
RESOURCE MATERIAL PREP. - SELECT.
FIELD TEST
PRODUCTION
OBJECTIVES
APPROACH SELECTIONS
Television
OBJECTIVES
CONTENT
MATERIAL PREPARATION
WALK THRU
REHEARSAL
TAPE
STUDENT SELECTION
STUDENT ACTIVITY
FACULTY ORIENTATION
SMALL GROUP INSTRUCTION
EVALUATION
FACULTY ORIENTATION
LARGE GROUP INSTRUCTION
LIVE
OR
LIVE ORIENTATION
T. V.
LIVE FOLLOW-UP

R. DIAMOND, 7/19/65

must be answered by the curriculum expert, the subject matter specialist and the classroom teacher. Unfortunately, in the past, a particular approach has often been selected simply because it was the technique that the researcher was interested in or because the materials happened to be readily available. The additional problem of evaluating techniques and procedures has been compounded by the tendency of teachers to state instructional objectives in such broad and often undefinable terms that any measurement of success or failure was literally impossible.

It is the hope of systems designers that a system will provide a rationale for decision as well as a means of measuring success or failure.

Statement of Objectives

The success of any instructional program is measured by how well it meets its pre-stated objectives. As Wesley Meierhenry wrote in his paper for the first Nebraska symposium:

> . . . after specifying behavior outcomes one should be able to make more explicit the instructional procedures and thus identify the experiences which should be used to reach them.[1]

Handicapped by a lack of clearly defined behavioral objectives for courses and curriculums, we have been unable, with few exceptions, to form a basis for many of our decisions concerning technique and content and to identify major inadequacies and voids in instructional programs. As a result, researchers have often found it impossible to evaluate accurately the instructional sequence itself.

According to the system design four distinct areas must be explored in the development of terminal educational objectives:

1. needs of the student
2. needs of the society
3. needs of the school or university
4. and, the domain of knowledge.

When this is done, one key factor becomes obvious. *While terminal objectives for various groups of students may be similar, the developmental instructional objectives and techniques will vary significantly from one student population to another.* Nowhere is this more apparent than in developing an educational program for the hearing impaired or deaf child.

The needs of the hearing impaired child are unique. Learning tools and techniques that have proved successful with hearing children will seldom work effectively with the hearing impaired, particularly during the early levels of instruction when vocabulary and learning skills must be developed. In their paper at the first symposium, Delgado and Gough stated:

> . . . existing materials are generally so heavily dependent on auditory communication that the deaf child is cut off from all except the most obvious and concrete implications of the average presentation.[2]

The broad understanding of language and its patterns, that are assimilated almost unconsciously by the hearing child before he enters a formal educational situation, is virtually non-existent in the hearing impaired. As a result, most teachers either modify existing materials or design their own to provide a background of understanding. The hearing impaired child requires many instructional sequences designed for him, and him alone.

The needs of society will vary from region to region and from time to time. If the hearing impaired child is to become a working member of his society, careful analysis must be made of the type of opportunities that exist for him. The needs of society are not consistent, neither are the opportunities.

Course content and the domain of knowledge is presently undergoing major transition. The problem of developing instructional objectives is further compounded by the major change taking place in educational curriculums. It should be remembered that the same changes that affect the general population also affect the deaf student. For example, recent major modifications in teaching math and science affect both groups equally. Today, many subject fields are changing both in basic content and the level at which certain concepts are being introduced. Subjects once reserved for college are now taught in high school, high school subjects are introduced in the junior high and so on down to the elementary school. For example, calculus has been successfully taught in the second grade. Colleges today find increasing numbers of incoming freshmen who are able to work at the second or third year levels in various courses. As major programs for hearing impaired children are developed, these changes too must be considered.

Selecting the Instructional Configuration

Just how should a particular course be taught? What should the role of the teacher be? What is the responsibility of the student? Which teaching configuration should be used? The very fact that hearing impaired children comprise a small minority of the total school population affects the final instructional configuration. Larger communities which are able to isolate this special population into large enough groups to warrant full-time, special class sections have alternatives open to them that are impossible in smaller school districts.

The number of qualified teachers available also varies substantially. The greater the number of children a specialist must serve, the greater the need for utilizing the regular classroom teacher in combination with independent study by the student. Special facilities, money for development and experimentation, student schedules and available instructional resources must be taken into consideration before a final decision can be made.

Independent study This includes the portion of the learning sequence that a student can accomplish working alone. It may be in a library, a study hall, a laboratory, at home, or looking into the future, in a study cubicle utilizing a highly sophisticated computer-based learning unit. There are parts of every course that the student can complete through independent study. However, to be done successfully, these activities must first be identified and then carefully planned and directed by the classroom teacher.

Large group instruction (one-way transmission) This comprises the part of the instructional sequence where the teacher demonstrates or lectures and the students observe and take notes. It should be noted that this type of learning may consist of many students in a single room or lecture hall or it may include a large number of individuals, singly or in groups, who receive the same presentation at the same time. While perhaps the most economical of the three teaching configurations, it is also the most difficult to use with the hearing impaired who must rely almost exclusively on the visual image.

Interaction In most learning sequences many objectives can be met only when the teacher and the student interact directly with one another. High priority is, and must be, given this activity in designing an instructional system for hearing impaired students—it is after all the ideal teaching configuration in this situation. Unfortunately it is impossible to provide this one-to-one relationship for *all* of the students *all* of the time. The question remains . . . what part of the instructional program *can only* be accomplished through this technique.

To achieve maximum efficiency and effectiveness in an instructional program we must utilize all three configurations—independent study, large group instruction, and student-teacher interaction. The third configuration, the most expensive in time and money, should be reserved for instructional situations whose objectives can be achieved in no other way.

The question becomes then, how can we utilize instructional media to assist in developing a learning sequence that will provide the hearing impaired children with a quality program, taught with maximum efficiency, and fully utilizing the talents of the student and teacher?

Selecting the Right Tool for the Right Job

Today, a wide variety of teaching tools are available. Unfortunately they have often been oversold, misused and few have been designed for use with the hearing impaired students. However, when selected with care and used properly, they can bring an effective new element into the classroom.

We find exciting work being done in many areas: programmed instruction, 8mm cartridge and 16mm films, overhead projectors, and computer based instruction, to name but a few. The teacher and administrator thus are faced with a major problem. With so many alternatives available how does one decide just what *is* the right tool for a particular job? The multiplicity of questions raised earlier in this paper show clearly that there is no single answer; the final decision must be based on many factors and will vary from classroom to classroom. Often completely different approaches will be used successfully to solve the same problem. On what basis can this selection be made?

A Case Study: Television

Of all the media the one that has possibly found less acceptance than any other in teaching hearing impaired children is television. For the purpose of this paper let us consider the potential of the medium, the needs of hearing impaired students, and utilize a systems approach to develop some possible applications, limitations and guidelines.

What is television? For practical purposes, television is nothing more than a process of electronically transmitting pictures (video) and sound (audio). It can transmit to many locations simultaneously or, by using a video tape recorder, provide immediate or delayed playback.

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What has been done with television in teaching the hearing impaired? Up to now there have been three specific (and somewhat overlapping) uses of television in this area: the teaching of lipreading, general instruction, and public information.

1. The first television series designed to teach lipreading was produced by station KUON at the University of Nebraska in 1956 and consisted of sixteen half-hour lessons. This was followed in 1957 by a slightly broader series produced by the Denver Hearing Society and televised over station KRMA-TV and, in 1958, by a series developed at the University of Wisconsin. The most extensive program was the "Let's Lipread" course for adults and secondary school students produced by the Greater Washington Educational Television Association and reported in detail during the first symposium.[3] This series of thirty half-hour lessons has been used successfully by numerous educational television stations in various parts of the country.
2. The only example of instructional use of television for the hearing impaired, other than lipreading, was the first series ever presented specifically for the deaf, "The Silent World." This intermittent series began in 1952 over the BBC and, during its seven-year history, presented a series of broad general information programs aimed primarily at the younger student.
3. In 1955 the University of Southern California and the Hearing Center of Metropolitan Los Angeles produced over station KTHE a series called "Bring Them Back to the Hearing World." The programs were aimed specifically at informing the general public about the needs of the aurally handicapped. It is interesting to note that, while not designed for the purpose, public information was a major by-product of the other series that have been produced.

What have we found out? From the experience of those involved in these programs, some important insights have been gained.

1. The large majority of instructional television programs now available are designed for the hearing student and are not effective with the hearing impaired child. As Robert Smith said in his paper:

   > This problem (the relationship between the video and the audio portions of a lesson) was highlighted by the rather lamentable fact that instructional television traditionally relies upon the spoken word to carry the burden of most of its content, calling upon visual displays and materials primarily for 'reinforcement' or illustration.[4]

2. Television lessons for the deaf and hearing impaired required distinctly different production techniques and procedures. With captions playing such an important role the television teacher of the deaf must follow a *fully* written script, a practice that is frowned upon by most experts in instructional television. Pacing of a lesson must also be substantially altered. For example, television instructors have found that for effective teaching of lipreading it is often best to have the complete phrase shown in caption form, before and after a view of the teacher. Under any situation the pacing must be much slower and more deliberate. The production format, too,

must be changed. Unlike standard television, the written visual and the face cannot be shown simultaneously—with the hearing impaired child they compete rather than reinforce. Even the director's use of his camera must be altered. While in most presentations the camera angle is varied to provide change of pace and create emphasis, the director of a lesson for the hard-of-hearing is limited to relatively static head and shoulder shots when lipreading is anticipated.

3. Television can reach a wide audience and be an effective teaching tool when used properly for selected purposes. For example, an interesting finding from the Washington Project was that a part of the audience consisted of people who were not willing to admit their handicap publicly but, through television, took the lessons privately in their own homes. In the Miami, Florida, area one of the strongest demands for a lipreading course came from professional men and women who felt that their work was beginning to suffer because of gradual loss of hearing. It should be remembered that the television instructor has several advantages over most classroom teachers. Under ideal conditions, adequate time is allowed for lesson planning, expert production support is supplied and a wide variety of instructional tools and techniques not usually available to the classroom teacher are provided. With television it becomes possible to reach students who cannot be reached in any other way.

When Do We Use Television?

From what we already know television can be used effectively in teaching selected subjects to the hearing impaired child and adult. When do we use it? What are some possible applications that have yet to be made?

Television is an obvious choice when we want to reach adults in their homes or students who do not have specially trained teachers available to them. Somewhat surprising is the fact that there is no instructional television series designed to teach subject matter content to the hearing impaired. In exploring past uses of the medium there is not a single example of television being designed to teach mathematics, science, history or any other academic subject to the deaf child.

Television may also serve as a technique for expanded utilization of available instructional resources. For example, several school districts are exploring the use of the medium to permit the same film to be seen simultaneously in many schools, thus reducing the need for multiple copies of certain films. It should be noted that this introduces a copyright problem that has not yet been resolved.

The use of the medium in the training of teachers of the hearing impaired has yet to be explored. Experiments with observation by television for teacher training have proved the technique extremely effective. For observation purposes small, remotely controlled cameras are placed in the classroom permitting student teachers and professionals, located in another room or another building, to view and hear what is going on without disturbing the classroom teacher and students. This technique allows viewers to discuss classroom activities at the same time they are seeing extreme close-ups of the children and their teacher. Video tape permits an institution to store a series of these observations for use later in the instructional program. Outstanding demonstrations can be made available for wider distribution.

Another use of the video tape recorder that has not yet been explored in the teaching the hearing impaired is the use of this device as part of the instructional program itself. Would the ability to see his own facial movement and to "hear" his own voice prove to be an effective instructional tool for teaching the deaf to speak? With inexpensive video tape recorders (less than $500) which are expected to be available in the next few years, this approach certainly deserves experimentation.

In summarizing the possible uses of television in teaching the hearing impaired, the following guidelines might be offered. Television should be considered as an instructional tool if:

1. The number of specialists is limited and the student body is large enough (more than several hundred) to warrant the expense. Studio television, when done well, takes time, talent and money.
2. The intended audience is scattered and cannot be taught directly by any other technique.
3. Classroom observation is desired.
4. The objectives can be accomplished primarily by a one-way transmission situation.
5. Immediate replay is required.
6. The resources available are in limited supply.

Other approaches should be considered if:

1. The number of students is limited.
2. Interaction or immediate feedback is required.
3. The objective can be accomplished, within financial limitations, by independent study on the part of the student.
4. Enough teachers are available to do an effective teaching job for the entire program.
5. The student population is extremely diverse (little similarity in status or terminal objectives).
6. The objectives can be reached by techniques that are either less expensive or more efficient.

A Rationale for Decision

In short, when exploring new teaching tools and techniques all available resources and approaches should be explored in a systematic manner. Success will not be obtained unless terminal objectives are stated in behavioral terms and the process of evaluation is a continual one. No one tool can be expected to solve all problems and a decision cannot be made until certain facts are known. It should be anticipated that each instructional situation will be unique and will require, to some extent, its own set of procedures and techniques.

In review, two points should be emphasized:

1. The hearing impaired child requires tools and techniques designed for him and him alone.
2. These tools and techniques, with only a few exceptions, are not yet available.

Many exciting programs are underway but major work lies ahead. Instructional resources are not being fully utilized in teaching hearing impaired children. Effective and efficient teaching programs will become available when a systems approach to instructional development is carefully applied and implemented.

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CHAPTER VIII

A MULTI-FACETED APPROACH TO TEACHING

by S. N. Postlethwait
Professor of Botany
Purdue University

Dr. Samuel N. Postlethwait, Professor of Biology at Purdue University, received his Bachelors degree from Fairmont State College, his Masters from West Virginia and his Doctorate from Iowa. Dr. Postlethwait has taught in the public schools of West Virginia and Iowa State University. He was a National Science Foundation Faculty Fellow at Manchester University. In 1965 Dr. Postlethwait was honored by Best Teacher Awards from both the Purdue Student Government and Sigma Delta Chi. Much work has been devoted by Dr. Postlethwait to investigating the audio-tutorial and "multi-faceted" methods of teaching Botany to college students. During 1964 and 1965 he was invited to participate in more than thirty meetings, workshops, and conferences at which he demonstrated and explained this new approach. Besides these many engagements and his teaching duties Dr. Postlethwait has served on several committees including: The Committee on Undergraduate Education in the Biological Sciences Panel on Laboratory Innovation; Representative of the Botanical Society of America to the American Association for the Advancement of Science Cooperative Committee for the Teaching of Mathematics and Science; and the Botanical Society Committee on Education.

A MULTI-FACETED APPROACH TO TEACHING

President Hovde at Purdue University when welcoming freshmen to the campus often makes the comment that learning is an individual process. It is axiomatic that learning must be done by the individual and a college can merely provide facilities, direction and stimulus to the student. When a student enrolls in a school, the student commits himself to the most rewarding and thrilling of life experiences, that of self-improvement or learning. A person who accepts a position as a teacher commits himself to assisting students in this effort. It is logical then that both students and teachers should be concerned with the kinds of activities which result in learning and that each would be committed to the development of situations in which these activities could take place.

While it is true that little is known about the learning process, some of the common principles of learning which are well known are seldom practiced by students and seldom made available to them by instructors. Conventional structuring of most school disciplines does not focus on the needs of individual students but rather on the problems of administration and teachers' convenience. Perhaps it is not necessary or even desirable in this paper to note examples; however, one need only look at the entire education system to see that the administrative problem of accounting for students and arranging their attendance in classrooms has resulted in a tendency to equate sitting in a classroom with learning. In many cases the prime objective of "helping students learn" has been relegated to the background in order to accommodate administrative problems. It is gratifying that in many places across the country steps are now being taken to refocus attention on individual needs and how these can be best provided for. Some activities and situations which contribute to learning include repetition, concentration, association, small unit steps, immediate correction and reinforcement, interaction between student and instructor, interaction between students, multisensory approaches, and the sequencing of learning events with each event structured as dictated by the nature of the subject matter. Modern technology has provided the teacher an opportunity to select from a wide range of communication devices. The presentation can be through the medium best adapted both to the subject and to the student. Most subject matter is complex and requires a multi-faceted approach. If learning is indeed an individual process, the student should have an opportunity for maximum control of the rate.

For the past four years at Purdue University, an attempt has been made to employ these principles in structuring a course in freshmen botany. The course initially was taught by two hours of lectures, one hour of recitation and three hours of laboratory per week. The restructured course includes only "study sessions." Two of these are scheduled. The study sessions include a General Assembly Session (GAS), an Integrated Quiz Session (IQS) and an Independent Study Session (ISS).

The General Assembly Session (GAS) meets one hour each week and is under the general supervision of the senior instructor in the course. Attendance is not mandatory. On this occasion the senior instructor attempts to set an intellectual tone for the course, establish rapport with the students, and orient the subject matter for the week. The GAS permits utilization of telelectures, guest lecturers and the showing of long films.

The Integrated Quiz Session (IQS) involves 8 (eight) students on a scheduled basis one-half hour each week. These sessions are in charge of the most experienced instructors in the course and are used as a vehicle for administration of grades and identification of individual students with a specific instructor. The half hour is spent in an informal discussion with all participants seated around a table. The various items such as specimens, experimental apparatus, charts, etc., which were included in the learning center the previous week are made available. Each student is asked to discuss one of the items and to contribute to a fellow student's discussion of the other items. The discussion is in the nature of an oral quiz. The instructor hands an item to a particular student, and it is expected that the student will first identify the item, second, explain its role in the week's study and third, discuss how it fulfills this role. Since the discussion always follows this pattern, each student is fully aware of what is expected of him and during his study will prepare a little lecture about each item. The instructor makes a conscious effort to program the discussion in a logical sequence thus leading the students to a better understanding of the organization of the subject matter. The session is an excellent learning situation for the student in that it enables him to put the finishing touches on his earlier study and clarify some of the misunderstood points. It provides an excellent feedback to the instructor on the success of his program and suggests ways for improvement.

The first semester the IQS session was tried, the students were assigned a grade of pass or fail. Students expressed dissatisfaction with this vague grade assignment and requested a more specific evaluation. Currently, the instructor subjectively judges the performance of each student. He places the student in one of three categories: excellent (nine points), mediocre (seven points), or poor (five points). The grades then are raised or lowered further by the additional volunteer contributions of the student during the performance of his colleagues.

An Independent Study Session (ISS) is conducted in a learning center equipped with booths and tape players. The student attends on an unscheduled basis. He signs in on arrival and out on departure on a card provided in a card file. The student is at liberty to spend as much time in study in the learning center as he feels necessary to learn the subject matter to an appropriate level. The learning center is equipped with thirty booths to serve up to 500 students. Each booth is set up identically and materials are available for one week only. The booth includes a tape player, an 8mm Technicolor projector, specimens, microscope, microscope slides, experimental equipment and other materials appropriate to the subject matter for the week. The student brings along his text books, study guide, and *Scientific American* articles. The voice on the tape, that of the senior instructor in the course, tutors the student through a sequence of integrated learning events. These may include a brief lecture introducing the subject for the week, reading from the text book or *Scientific American* article, doing an experiment, studying specimens through the microscope, filling in charts or diagrams, collecting data, viewing 8mm films or any other activity which will contribute to the student's understanding of the subject matter involved. Materials which are too bulky for inclusion in the booth are placed on an experiment table and the student is requested to turn off the tape at the appropriate time and go to the experiment table to perform an experiment, collect data or other appropriate activity. A teaching assistant is on duty from 7:30 A.M. until 10:30 P.M. Monday through Friday to give assistance with the individual needs of the students. The student proceeds independently, if he so desires, and at his own pace.

The result of the Audio Tutorial approach as reflected in the performance of the students during the past four years has been improved learning at all levels. A's increased from 7% to 22%, B's from 20% to 35%, and F's have decreased from 20% to 7%. The system is still evolving, and the author feels that as more "soft-ware" becomes available for implementation of the above ideas even greater improvement is possible.

It would be presumptuous for a professor of biology whose major interest is corn morphology to make recommendations to those of you who have had extensive experience in teaching of the deaf. However, some of the basic philosophy on which the programming of the botany course is based should apply to individuals who wish to learn regardless of their handicap. The restructuring of our botany course was motivated initially for students handicapped by a deficient background. Perhaps some of the principles suggested will apply for students who have poor eyesight, reduced dexterity, partial or complete hearing loss or even to people with no physical limitation. The basic assumption is that individuals differ in many ways. Perception is achieved by different individuals in many different ways, some by feeling, others by seeing, some by reading, some by hearing and by various combinations of these. The potential of an individual is not specified by his handicap or apparent physical limitation. If one can stimulate the unimpaired senses of an individual, it may be possible for that individual to achieve equal or more accurate perception and understanding of a subject than can be achieved by other individuals who have no physical handicap at all. One can cite as an example the extreme case of the great Olympic runner, Cunningham, who overcame a handicap which doctors anticipated would even prevent walking. The great triumphs of Helen Keller also would represent a case in point. One should take courage then from these extreme cases and deal with the less difficult ones in a more determined and aggressive way.

The following are some points which may be of some significance:

1. Since the audio-tutorial system involves the use of audio-tape as a vehicle for sequencing learning events, it may be that its use can overcome some problems simply through the mechanics of amplification and other appropriate adjustment to enable the partially deaf to hear.
2. The audio-tutorial system as envisioned by the author exploits the use of all senses in the programming of the learning sequence and should result in various senses reinforcing or complementing one another.
3. The audio-tutorial system permits the teacher to structure activities such as repetition, association, concentration, etc., known to contribute to the learning of subject matter.
4. The teacher operates on a tutorial basis using the communication vehicle as a method of providing one to one, student to teacher, ratio.
5. The audio-tutorial system provides the student an opportunity to progress in small unit steps, the teacher to develop a logical sequencing of learning events, and individualized instruction.

In summary, the author is keenly aware of his inadequacies to visualize the problems in teaching the deaf. However, education is a science, and one may begin as with any other problem by clearly defining the problem first. Once the problem is defined, the solution is often evident. Basically the problem is to help the learner learn, and since learning must be done by the learner, one should design all activities to require involvement of the learner with a total focus on what objectives are to be achieved, the facilities available to achieve these, and how this person as an individual can best approach or grow to acquire the desired characteristics. If audio is eliminated as a pathway, the many other facilities and communication devices must be exploited.

CHAPTER IX

A MULTI-MEDIA APPROACH IN THE CLASSROOM FOR THE DEAF

by ROBERT J. SCHMITT
Assistant Project Director
New Mexico Foundation, Inc.

Mr. Robert J. Schmitt is a native of St. Louis, Missouri. Mr. Schmitt received his A.B. from Washington University in St. Louis. He was honored by membership in Phi Delta Kappa and Phi Beta Kappa. After two years in the army, he attended the Central Institute for the Deaf and participated in the Deaf Teachers training program. Mr. Schmitt received an M.S. degree in Speech and Hearing from Washington University. While at C.I.D. he received the Goldstein Scholarship Award. Mr. Schmitt taught at C.I.D. in the Speech Department and then moved to Houston, Texas, and taught in the public school day classes for the deaf. He also taught in the teacher training programs at the University of Houston and Texas Southern University. For the last four years Mr. Schmitt has been a supervisor of classes in the County-wide Program for the Deaf in the Houston Independent School District.

Mr. Schmitt was currently on a one year's leave of absence from the Houston Schools to work as Assistant Director of the New Mexico Foundation, Inc., which is under contract to Captioned Films for the Deaf. His time this past year has been shared primarily between the Arizona and Arkansas Schools for the Deaf, where as a part of "Operation Hurdle" teachers of the deaf are being supplied with new media and trained in their use. Mr. Schmitt has been touring schools for the deaf assisting in workshops and demonstrating for teachers the multi-media approach. Mr. Schmitt attended the N.D.E.A. Media Institute at the University of Nebraska last summer (1965) and taught at the Captioned Films Media Institute this summer (1966, U.N.).

He will return to the Houston Public Schools in the fall (1966).

A MULTI-MEDIA APPROACH IN THE CLASSROOM FOR THE DEAF

Explanation

This paper is not meant to be a report on a Captioned Films for the Deaf research project, although the multi-media approach to teaching language to deaf children which will be demonstrated in one of the symposium sessions is an important aspect of a Captioned Films funded teacher training and equipment testing program, "Operation Hurdle." The intent of this paper is to provide a description of equipment and materials which will be used in the demonstration and further, to present some personal observations concerning new media and their use in the classroom to improve the instruction of deaf children. Hopefully, there will be offered herein some new information which will be of assistance to administrators, supervisors, and teachers who are charged with the enormous responsibility of teaching language to deaf children.

Background

The first reported steps taken toward the development of a multimedia approach to teaching in a classroom for the deaf using new media were presented in a paper, "Use of New Media and Techniques in a School for the Deaf," prepared for the 1965 Educational Media Symposium in Lincoln by Mr. William Jackson, Director of Visual Aids at the Pilot School for the Deaf in Dallas, Texas. The present approach is an expansion of Mr. Jackson's original realization in which overhead projectors were used effectively in conjunction with remote controlled filmstrip projectors in the classroom by experienced teachers of the deaf who had received instruction in the operation of visual aids.

Dr. Marshall Hester, Project Director of the New Mexico Foundation, on a visit to the Pilot School, recognized the vast language teaching potential of the two-projector, two-screen approach, and formulated plans for "the automated classroom for the deaf." Two more remote controlled projectors were added to the equipment plus an electric pointer and a central control box which permits the teacher to use any projector that she desires without having to leave her position of advantage at the side of the overhead projector.

At this point, as assistant project director (an experienced, trained teacher of the deaf) was employed and sent to a summer N.D.E.A. Media Institute at the University of Nebraska to receive instruction in material preparation techniques and the operation and utilization of new media. It has been the responsibility of this educational media specialist to prepare and present demonstrations in which all media in the automated classroom are coordinated and employed to teach a set of closely related concepts with their appropriate language to groups of deaf children.

Rationale

The rationale underlying such an undertaking may be stated simply. Deaf children must learn primarily through their vision. Based on discouraging statistics concerning the overall poor academic achievement of school leavers for the past few years, deaf children now in school are going to have to learn a great deal more visually, or in any other way, if they are going to compete successfully in the automated, technically-complex world of employment of today and tomorrow.

The multi-media approach is an attempt:

1. to increase the use and effectiveness of coordinated visual stimuli in the classroom
2. to provide more appropriate vocabulary and language in the same amount of time with the invaluable aid of the overhead projector
3. to use various new media to provide ample, interesting repetitions which are necessary for learning

4. to supply opportunities which permit the deaf child to practice and then use the language

Thus, the multi-media approach in the classroom for the deaf is an attempt to teach more language to children in a shorter period of time and thereby provide them with more education.

Purpose of the Demonstration

It is now possible with new media literally to bombard each child with a multitude of meaningful visual stimuli on the same topic and provide opportunities for appropriate language to be repeated by the children without boredom until it is mastered. It is hoped that new media will challenge the teacher to do more horizontal or, better still, depth teaching at each level.

The multi-media demonstration will be an unrehearsed presentation of an actual teaching situation in which an attempt will be made to present one fifty minute lesson in depth. Although children will be used, this particular demonstration will not be centered upon them or their ability. The emphasis is on new media and one way in which they can be utilized to expand a deaf child's language through more meaningful visual learning experiences.

Truthfully, the demonstration will not be one which could be duplicated regularly in your classroom at the present time due to the scarcity of suitable materials on any one subject. It is all but impossible to find a captioned film, an 8 millimeter cartridge film, a filmstrip, and commercially prepared transparencies on more than a few subjects suitable for instruction in a lower or middle school classroom for the deaf. Relief of the material shortage is on the way. A materials production center specifically set up for reproducing and distributing transparencies, films, still pictures, and other teaching tools designed for the deaf is already a reality at the University of Nebraska. In addition to this, Captioned Films will make available one hundred fifty new titles in its educational film series during the current year.

Equipment

An overhead projector This piece of equipment is the least complex in mechanical construction and operation of any projection equipment found in the automated classroom. In selecting an overhead projector for a class of deaf children, check for the following:

1. The overhead should be simple to operate. A three position switch is desirable; one position for "Off," a second for "Fan Only," and a third for "Lamp plus Fan." As with most projection equipment, running the fan on the overhead for a short time after the lamp has been turned off will lengthen the life of the lamp.
2. The projector should be light weight for easy portability.
3. The projector should have an efficient cooling system—a fan, but it must be quiet. Some projectors are quite undesirable because of a loud fan hum which is picked up and amplified by individual or group aids.
4. The overhead should be capable of producing a bright, clear image on a screen in a fully lighted room. This is one of the main assets of the projector as far as its use with the deaf is concerned.

5. The overhead should have a means of elevation so that its projected image can be raised high enough over the head of the teacher that all of it can be seen by all members of the class. This is accomplished better with a projector that has a head which tilts rather than front legs which raise and thereby tilt the entire projector including its writing surface.
6. Of major importance, any overhead put into a classroom for the deaf must have a provision on it for the attachment of an acetate roll.

An 8 millimeter cartridge projector At the present time, only one company produces the cartridge projector. The rear projection model used in the demonstration is excellent for classroom viewing as its picture is large enough to be seen by a class of eight or ten children and its image is bright enough to be viewed without having to darken the room. This piece of equipment was not designed for large group viewing. Because of its ease of operation, the 8 millimeter cartridge projector is ideal for self-instruction programs in the classroom or in the dormitory.

This projector is also available with a still framing control control which not only permits stopping the film at any point with the lamp lit, but also enables the person controlling the projector to advance the film one frame at a time so that any sequence may be slowed down for more careful viewing.

A 16 millimeter sound film projector The two things essential in a 16 millimeter projector for use with deaf children are a remote control box which permits the teacher to control the projection of a film from the front of the classroom, and a still framing device which permits stopping the film with the lamp on and the shutter open at any time without damaging the film. At the present time there is only one projector available which incorporates both of these features.

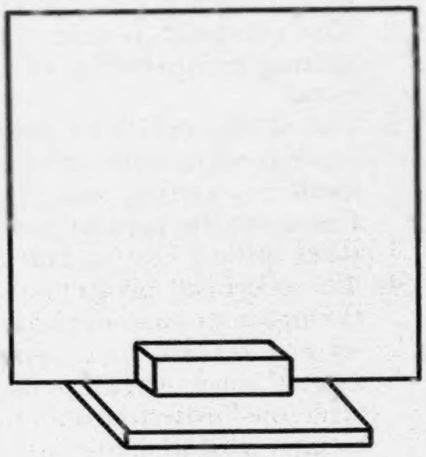
A filmstrip projector The prime requisite of a filmstrip projector is again a remote control attachment. Also of importance are the size and weight of the projector. A small, light-weight projector that is easy to handle, easy to use, and easy to store will be used more often than one that is large, bulky, and awkward to operate. There are many good filmstrip projectors available that include adaptors which permit manual projection of slides. This combination projector is outdated as far as the automated classroom is concerned.

For the effective use of slides as a teaching media, every school should have a remote controlled slide projector whose trays, which hold up to eighty slides, can be filled with whatever pictures are necessary in whatever order the teacher desires them.

Projection tables Three tables are required in the multi-media demonstration. All three tables are on wheels. All three tables have a wheel locking device. A sixteen-inch high projector cart makes an ideal base for the overhead projector. This size cart puts the stage of the overhead at a comfortable writing height when the teacher is seated beside it. Furthermore, if the teacher sits forward and close enough to the overhead, with the acetate roll extending slightly over her lap, the light from the stage of the projector adds extra illumination to her face. This additional light has been described by several deaf adults as "beneficial" to lipreading. The table for the 8 millimeter unit should be about 30 inches tall. The projection table for the 16 millimeter and filmstrip projectors should be about 42 inches high.

One commercial projection screen Either a 50 x 50 inch tilting type screen or a 50 x 50 wall screen mounted on brackets which extend out from the wall about 14 inches will suffice. For the pull down screen, provision should be made for attaching the handle of the screen to the inside edge of the chalkboard ledge at the base of the chalkboard. A small cup hook and length of thin chain will suffice. The screen on which the overhead is projected must be tilted so that the beam of light striking it hits it at a ninety degree angle or there will be a noticeable keystoning of the image.

A second projection screen A 30 x 30 inch screen can be made inexpensively from ¼″ tempered masonite covered with two coats of high quality, flat, white latex paint. A stable base, 12 x 16 inches, can be made of ¾″ plywood with the screen supported between two wooden blocks (10 x 1½ x 2) attached to the base board. The screen will fit on top of the 8 millimeter projection unit. (See diagram)



A master control box This box contains enough electrical outlets to plug in all the equipment needed. A switch for each plug activates or deactivates any piece of equipment. The equipment remote control buttons are then used to regulate the rate of the presentation of material. A new control box is being built which will include relay switches which will lower the classroom lights whenever any projector is turned on other than the overhead.

Materials

A captioned film

An 8 millimeter cartridge film Cartridge films are often referred to as single concept films, because their brevity permits coverage of only a small amount of material. These films, about 2,000 of which are available on the commercial market, usually run three to four minutes. Cartridge films are available in color as well as black and white. They are silent and for the most part are without titles. None of the commercially available films were made specifically for the deaf, except a series on fingerspelling produced with Vocational Rehabilitation funds.

A filmstrip

Commercially prepared transparencies

Hand-made transparencies The teacher may create her own transparencies either by hand or with the aid of the heat process copier. These transparencies provide opportunities for interesting repetition of vocabulary and language and finally are used to encourage individual expression of language by the children.

Marking pens Pens used for writing on the acetate roll on the overhead projector contain water-based ink so that marks can be easily removed from the roll with a damp cloth when they are no longer needed.

Suggestions to Teachers Concerning New Media

The overhead projector The overhead projector is the most important piece of electronic teaching equipment to enter classrooms for the deaf since the hearing aid.

1. The overhead replaces the blackboard in the classroom for the deaf. Now constant supervision of the class can be maintained while the teacher is writing, thus eliminating class disruptions which frequently occur when the teacher's back is toward the class.
2. The overhead permits immediate confirmation or clarification in writing or lipreading or fingerspelling when a child has not understood.
3. Use of the overhead permits faster children to share answers and contributions with slower members of the class without time being spent in writing answers on the chalkboard. Individual acetate sheets can be kept at each child's desk. A sentence written on the sheet with a crayon becomes an instant transparency.
4. The overhead projector is an excellent attention-getting and attention-maintenance device. By controlling the light either with the off and on switch or simply with a piece of paper placed over the lighted stage, attention can be refocused immediately on the teacher after the projected material has been read. Caution must be used so that children are not required to look at the teacher and the screen at the same time. Follow the procedure of talking and/or spelling and then writing or showing.
5. The acetate roll provides relief from the frustration of classrooms with not enough blackboard space for the storage of written information. Often called "the moving chalkboard," the acetate roll makes available fifty feet of writing surface. Think of this space in terms of re-reading and summarizing what has been covered at the end of a lesson or as a source for review before new material is added.
6. Of even greater importance, the light from the stage of the overhead on the face of the teacher permits her to communicate orally with deaf children when the room is dark during the showing of a film.

The 16 millimeter film Teachers often ask the best way to show a 16 millimeter film to deaf children. Many people feel that it should be shown all the way through for the sake of continuity. Others believe that it should be stopped periodically and summarized by the teacher to make sure that all of the children are understanding it. There is no one best way to show a film.

1. An uncaptioned film can be used for excellent reading practice by writing out the story on a series of transparencies and having the children pre-read what they are going to see. The story should be written in language and vocabulary that are right for the class; however, a few new unexplained words and even a new language principle may be included. Show the film in its entirety. Then show the film a second time stopping it at critical points to let the children match action with sentences, or discover themselves through visual stimuli the meaning of a new adjective, verb, or idiomatic language construction. Still, framing a motion picture adds thousands of teaching pictures to the teaching resources of the school.

2. If a film is used to reinforce pre-taught vocabulary, stop the film and have the children identify objects and sequences to show that they have understood what has been taught.
3. Do not overlook films as a way of continuing essential work in sequence with older children. Steps in a process shown on the screen can be written up on strips of acetate and presented in mixed-up order on the overhead. The boys and girls can select them in the right order as a check for understanding or as an immediate recall device. Once the correct sequence has been established in reading from the visual source, the sequence can be rewritten on the overhead in the language of the children.
4. In the projection of a science film or any film which has opportunities for drawing conclusions in it, stop the film and encourage the children to draw their own conclusions before seeing them on the screen. Have the children write their conclusions on sheets and hand them in for correction immediately after the correct answer is known.

The 8 millimeter cartridge film Any person who has an 8 millimeter movie camera and shoots 50 feet of film can have it put into a plastic cartridge for a small fee so that it can be projected in an 8 millimeter loop film projector. There are unlimited possibilities for shooting class field trips, school projects and events in 8 millimeter film and then using the films again and again to reinforce language.

Filmstrips The use of the overhead in conjunction with any filmstrip makes the strip suitable "language-wise" if it is suitable "concept-wise." A teacher can write her own titles on transparencies and coordinate the two media. Exposure to the more advanced language is incidental, but in many instances, opportunities occur in which synonyms or parallel language constructions are easily taught.

Conclusion

The multi-media approach is not a quick and easy solution to the problems of teaching the deaf. Effective use of the multi-media approach requires:

1. New media projection equipment readily available in every classroom
2. Superior teachers of the deaf who must be trained in the preparation of materials for and the utilization of new educational media
3. An increased supply of iconographic materials suitable for younger deaf children which can be incorporated into the preparation and presentation of language-centered experiences.

No longer is it *suggested* that a teacher preview a film or filmstrip before she uses it. This is now a requirement, as every bit of visual material used in a lesson should help to develop an understanding of the concept being taught. If only three minutes of a film concern the topic, those three minutes and not the entire film should be shown.

The automated classroom and the multi-media approach make every room in the school a visual aids room and every teacher of the deaf an educational media specialist in charge of her own center. Sturdy equipment that is operated easily by a teacher trained in its use will increase the number of visual stimuli used in the classroom and make every use of projected material the vital, language-centered experience that it must be.

CHAPTER X

APPLICATIONS OF SYSTEMS CONCEPT TO TEACHING THE DEAF

by Harriet Green Kopp, Ph.D., *Principal*
Detroit Day School for the Deaf

Dr. Harriet Green Kopp received a diploma from the Lexington School for the Deaf, her B.A. and her M.A. from Brooklyn College and her doctorate from Columbia University. Dr. Kopp has served as a member of the technical staff of Bell Telephone Laboratories. She has been a member of the faculties of Brooklyn College, Lexington School for the Deaf, Indiana University, Columbia University, Eastern Michigan University and the University of Michigan. Dr. Kopp was Director of Speech and Hearing at the Rehabilitation Institute of Metropolitan Detroit before assuming her present duties in 1959 as Principal of the Detroit Day School for the Deaf and Supervisor of Deaf and Hard of Hearing. Dr. Kopp is also presently involved in research concerning "visible speech."

Dr. Kopp is a member of the Conference of Executives of American Schools for the Deaf, the American Speech and Hearing Association, the Convention of Instructors of the Deaf, the Michigan Speech and Hearing Association, the Acoustical Society of America and the Council for Exceptional Children. She is also a Fellow of the American Speech and Hearing Association and on the Board of Directors of the Alexander Graham Bell Association for the Deaf. Dr. Kopp also is a Consultant on Research for the U.S. Office of Education and was recently appointed to the National Advisory Committee on Teacher Training in Education of the Deaf.

She also has several important publications to her credit. Dr. Kopp has been honored by inclusion in *Who's Who: American Women.*

APPLICATIONS OF SYSTEMS CONCEPT TO TEACHING THE DEAF

For too long, the deaf student like his hearing peers has been the passive victim of the active teacher. In our not too distant past, teachers of the deaf have been judged by their demonstration skills, by their vivacious personalities, their ability to forcefeed information; not by their knowledge of learning theory and their ability to apply this knowledge systematically to the development of self learning of carefully programmed subject matter under controlled conditions. Evaluation of teaching and of learning has been occasional not continuing. Since standards have been those of individual teachers or of single schools, it has been difficult to compare student progress on a regional or national basis. Concepts of diagnostic teaching have been accepted reluctantly by teachers and administrators. As a profession, we have been limited by the curriculum to which our teachers have been exposed. Even the historical title of our teacher education programs "teacher training" is an indictment. It presumes the learning of techniques by rote and recipe. We can no longer hide behind "The Method" espoused by a dynamic teacher into which all students must be fitted as in a Procrustean bed or be dismissed as uneducable, and to which all satellite teachers must be unquestionably loyal.

The proliferation of teaching media during and after World War II and the increasing national concern for quality education for our expanded population have forced us to evaluate our objectives, the route by which we attempt to attain our goals, and the success with which we achieve them. We must not resort to dependency upon instrumentation or regard equipment as a panacea for our curricular deficiencies. Most of the period since World War I has been devoted to the measurement of results of teaching by educational psychologists who were entranced by the manipulation of statistics to prove an a priori assumption dignified by being phrased as an hypothesis. B. F. Skinner expresses our present concern for the parameters of learning by stating that:

> the psychologists' results seldom generated new methods . . . The learning and forgetting curves emerging from learning theory research, memory drums, maze, discrimination box, and verbal problems were never useful in the classroom.

We have not been able to construct an effective system of education based upon the segmentalist approach to learning. Now the pendulum appears to be swinging once more to an emphasis upon behavioral objectives as they relate to teaching and learning.

Once more, we recall the assumptions postulated half a century ago by Dewey in *Democracy in Education:*

1. that a subject has an inherent logic that can be developed by the students themselves
2. that all subjects do not need to be taught the same number of periods per week
3. that class size should not remain constant for all subjects
4. that some subjects are inherently related and should be so taught and that each subject in the curriculum should be examined for its points of contact or overlap with other subjects.

If we can accept the further assumption that learning and teaching cannot take place until the behavioral patterns to be attained have been identified for a specific population in a specified situation, we are ready to explore the parameters of learning to be considered, the sequence within the continuum, the mode of teaching to be used at each level, the most efficient use of time of teachers and students, and the evaluation of learning so that we may be certain that learning is both functional and integrated.

Our technological capacity has far outstripped our understanding of the teaching process. Within the next few years, we will be able to communicate with individuals around the globe and to see them in color. Children are learning to read by using computer driven typewriters. For several years, we have had computers that can talk and that can act on voice commands in restricted language and articulation patterns. The voice operated typewriter is an experimental reality in three countries. In Japan, they are printing a morning newspaper from the family television set. Information technology has produced machines that store knowledge and retrieve it at staggering speeds with amazing accuracy. Information retrieval systems can be used to diagnose complex symptoms and to carry out complicated analyses.

It is reasonable to picture our students each in his own cubicle with his own T.V. screen. The teacher seated at her control console can evaluate his responses and thus his learning status continually throughout the lesson. He receives instant feedback to correct his mistakes. As his learning problems are diagnosed during the lesson, appropriate sequences are selected to provide needed reinforcement and to supplement the initial presentation.

There is only one small cloud in the crystal ball. Who has prepared the sequences? Who has programmed the computer? We are being forced to overcome our historic reluctance to examine the human data processing system on which learning depends. Each new information input requires that the human memory bank be scanned. If the new signal is different from previous information, a new pattern is processed. Increase in learning reflects the ability of the human computer system to pattern information and to integrate the patterns. The task for the student becomes much simpler if he is not forced to deal yith unrelated fragments of information. His processing is more efficient if he receives information in well planned, sequentially related units. In an ideal classroom, the student would never fail, because the quantity and quality of information in the sequences would be tailored to his needs. To do this, we must view a curriculum as a continuum with horizontal enrichment and remedial and supportive teaching available at each level as required by the student. The student progresses along this continuum as rapidly as is commensurate with his learning ability. For any particular student, this rate may be different for different subjects at different times. Under such circumstances we may be able to generate active learning with strong internal motivation.

We are forced by the practicalities of existence to recognize that such curricula are not now available. How then, may we use machine-teaching now while we struggle towards development of curriculum? We must select those areas in which information can be presented better on an individualized basis, those in which immediate feedback is essential and can be given through programming and those where illustration can serve as reinforcement or where information must be repeated in varying forms to assure retention.

In speech teaching, we have developed the visible speech cathode ray translator to provide an instantaneous visual feedback system. The deaf student may monitor his own speech and that of others. He receives positive reinforcement. He uses a normal modality to substitute in a feedback loop for a defective sensory input. He is not required to depend upon unreliable and inconsistent stimuli from kinesthetic and tactile receptors or upon limited and distorted acoustic input. He has visual phonemic reference patterns with which to compare his own.

Have we, as educators, attained similar objectives in other areas? In the early 60's, research by Rosenstein, Goetzinger and Huber found no difference in basic visual memory or discrimination for deaf and hearing children, although Furth found that the older hearing children improved more rapidly than did the deaf on a visual paired associates task. Doehring found the deaf and hearing equal on immediate visual recall, but the deaf inferior on delayed retention. McCarthy's deaf subjects were significantly inferior to their hearing peers in specific vocabulary and linguistic areas. We deplore the low reading level of many deaf students and the consequent academic retardation. But, where are the programmed sequences for remedial and developmental teaching in these areas of recognized weakness?

We have been aware, for over thirty years, that psycho-physiologic-physical research has defined the differences between the eye and ear as sensory receptors. The eye perceives globally and simultaneously. The ear perceives temporally, requiring the processing of rapid, temporally perceived sequences into the coding system of the C.N.S. When we consider kinesthetic and tactile reception, we are dealing with a less well defined perceptual field especially with regard to the articulators, phonators and resonators as they move within incredibly small tolerances. Yet we persist in a generalized multi-sensory approach to teaching the deaf without consideration of the need for developing uni-sensory skills. The student must learn to interpret multi-sensory stimuli; the problem for the teacher is to choose the most effective means by which to achieve this goal. Do we bombard the child with multi-sensory stimuli and let him, by trial and error, learn to pattern despite his known perceptual disorder or sensory deficit? Or, do we approach the teaching of interpretation of perceptual stimuli much as we do the teaching of motor skills or conceptualization through a logical and systematized approach designed to move from the simple to the complex, from the known to the unknown. As the individual learns to focus his attention selectively and volitionally, learning takes place in an orderly sequence in relation to the maturation stages which are biologically and socially critical for the development of the particular sense.

Do we consider the parameters of vision—discrimination of size, shape, color and depth, perception, perceptual span, memory span and recall—as each capable of development in the dimensions of accuracy, speed and complexity? Do we work systematically with a defective receptor to develop consistent patterning from minimal or distorted clues as in the reception of auditory stimuli? Do we bring our knowledge of audition to bear upon the construction of a curriculum in acoustic education, or do we use the historic shotgun approach applied to all without respect to the unique auditory deficit of the individual. Here, programming gives the teacher the opportunity of providing individual clinical teaching—using appropriate acoustic tapes or visual films with built-in feedback systems for self evaluation and reinforcement.

None of us, hearing or deaf, uses the visual system to its maximum potential. The deaf *must* make more efficient use of their prime receptor. We have accumulated sufficient research data now to enable us to construct individualized programmed remedial systems using single concept films and controlled speed exposures and responses. At the Detroit Day School for the Deaf we have constructed visual materials for tachistoscopic projection as integral parts of the language and reading curriculums. These materials are designed to develop perceptual skills, to improve the speed and accuracy of interpreting and patterning of sensory stimuli and to develop such cognitive skills and abilities as use of contextual clues, rapid organization of information, rapid classification of concepts and regrouping of concepts.

Preparation of functional programs is not a part time chore for the classroom teacher, but rather a task for sophisticated specialists in teaching media working under the direction of a qualified specialist in the education of the deaf who is knowledgeable in learning theory and learning problems.

Much of our education is derived from incidental learning, from repetition and from vivid, exciting experiences. It is the decrement in the rate and nature of incidental learning that may short out the deaf child's linguistic development. He develops his language in a somewhat different sequence than his hearing peer. His first information input comes from a combination of lipreading and gesture. If he is orally taught, the balance shifts towards lipreading with natural gesture in a secondary role. If he is manually taught, then gesture may be supplemented with fingerspelling. For many deaf children, language stimulation begins after the critical bio-social stages are past. It is probable that insufficient cerebral activity due to lack of significant and relevant experience produces a cortical inhibition which becomes irreversible, resulting in a failure to develop an effective functioning system for intellectual operation and for processing information received from the senses. The capacity for learning language may be maximized during the first few years and probably decreases sharply with the passage of time. How can we provide systematic exposure to necessary sensory and cognitive experiences during the first three years? What is the value in early identification of deaf infants, if we cannot supply a rigorous program of carefully controlled learning sequences to be used in the home to develop sensory perceptual skills and cortical functioning during the optimal period of neuro-physiological and social readiness.

After the third grade, reading must become the dominant teaching mode if the deaf child is to keep up with the rapid proliferation of subject matter. At this point, many incidental learning experiences which are basically acoustic for the hearing student, must be presented visually to the deaf. Birch and Stuckless experimented in developing language teaching in programmed form. Much of the emphasis of project LIFE has been directed to this end. However, there are simpler teaching tasks which demand our attention and which may prove more susceptible to programming immediately. The use of teaching machines would permit a flexible combination of group and individualized teaching of concepts and subsequent enrichment and drill in such subject matter areas as:

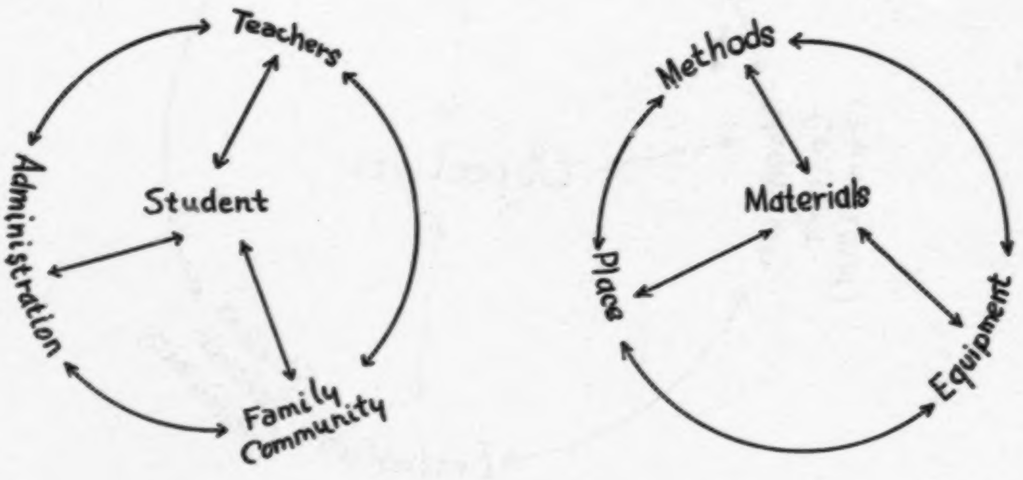
1. map reading

2. weather predicting
3. inductive and deductive processing skills
4. making change
5. telling time
6. and linear measurement.

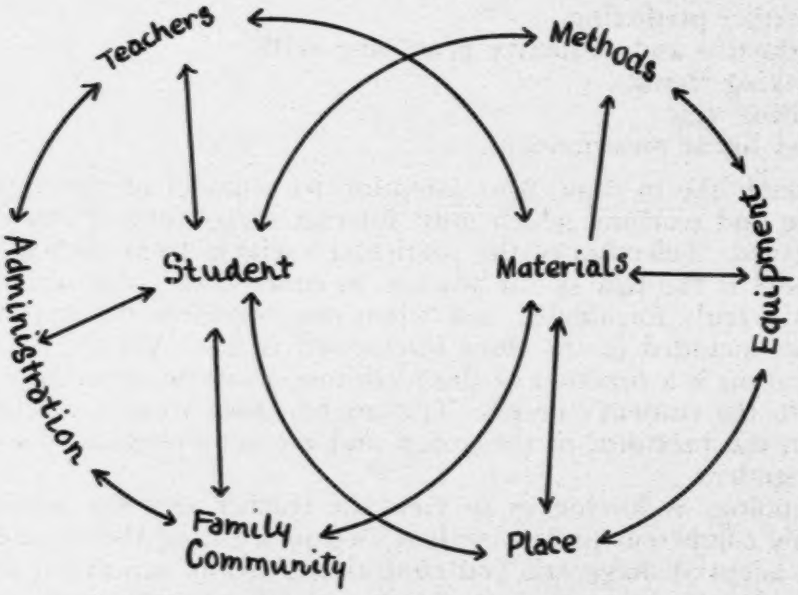
I should like to draw your attention to a model of the variables of learning and teaching which must interact successfully if learning is to be achieved. Selection of the particular variable from each segment of the model is the task of the teacher in concert with the administrator. This is a truly formidable task when one considers the partial list of variables included in the three interaction charts. Yet the effectiveness of education is a function of the fortuitous selection of variables appropriate to the student's needs. The teacher must tread a careful course between the pressures of the group and the requirements of each individual student.

Technology is forcing us to view the teacher and the administrator as highly competent professionals skilled in learning theory and subject matter, adept at diagnostic and clinical evaluation, concerned with individualized instruction, free to select optimal materials and equipment to meet the changing needs of the student. Education occurs best in a flexible, flowing situation as the individual moves from group teaching to individualized learning with strong internal motivation derived from successful learning experiences.

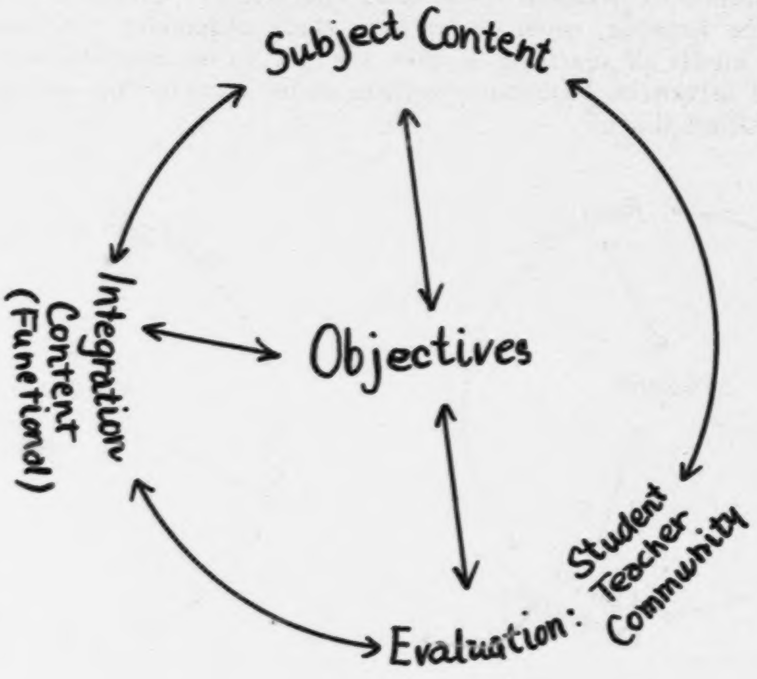
Can we shake free from the shackles of didactic group teaching? Are teacher education programs oriented toward the professional education of individuals to perform these tasks effectively? Educators of the deaf and of the hearing, must re-examine their objectives and must master the new media of teaching if they are not to be overwhelmed by technological advances. Instrumentation must remain the willing servant of the skilled master.



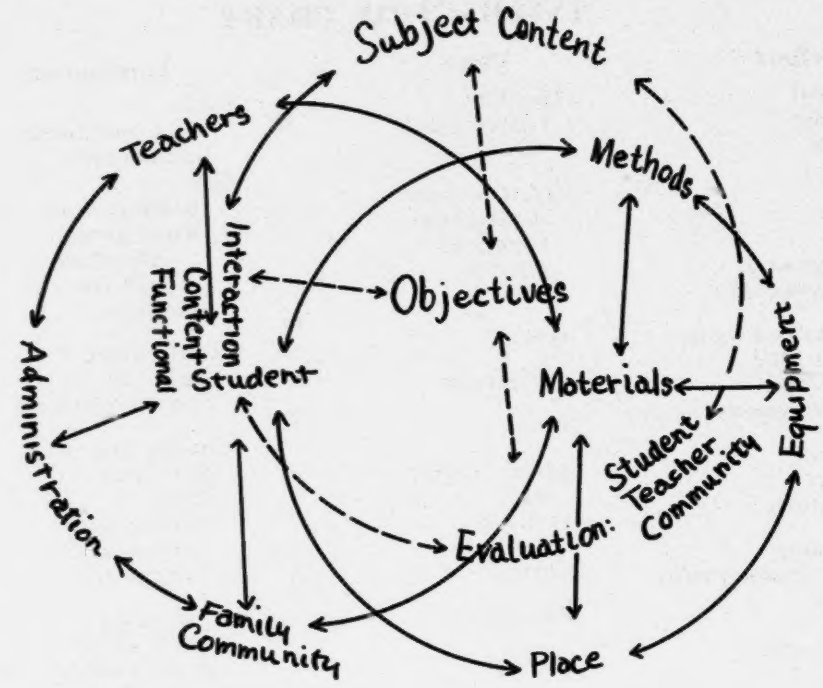
Interaction: Model I


Teachers
Methods
Student
Materials
Equipment
Administration
Family
Community
Place

Interaction: Model 2


Subject Content
Integration
Content
(Functional)
Objectives
Evaluation:
Student
Teacher
Community

Interaction: Model 3


Subject Content
Teachers
Methods
Interaction
Content
Functional
Objectives
Student
Administration
Materials
Equipment
Student
Teacher
Community
Evaluation:
Family
Community
Place

Interaction: Model 4

INTERACTION CHART

Method

- Individual
  - tutoring
  - clinical

- group
  - large
  - small
  - homogeneous
  - heterogeneous

- self contained room
- team teaching
- departmental
- unit-achievement

- uni-sensory
- bi-sensory
- multi-sensory

- conditioning
- positive reinforcement
- discovery
- didactic
- trial and error

- incidental
- direct
- indirect

- structured
- unstructured

- active (art)
  - physical
    - participation (science)
  - mental
    - participation (soc. st.)

- passive (sleep)
  - audio-stimulation (sleep)
  - tactile-stimulation
  - subliminal-stimulation

Place

- classroom
  - conventional
  - carrel

- informal room
  - small group
  - laboratory
  - activity
  - clinic

- lecture

- auditorium

- library

- special subject
  - art
  - science
  - vocational
  - gym

- field trip

- outdoors

- home

Equipment

- books
  - texts, workbooks
  - programmed
- films
  - 16 mm-group
  - 8 mm-group
    - individual
    - single concept
  - kinescopes

- closed circuit T.V.
  - immediate
  - delayed playback

- learning machines
  - slave-circuits
  - drill
  - new learning
    - association
    - integration

- tachistoscope
  - visual skills
  - visual feedback
  - association

- amplification
  - conventional
  - selective
  - translated
  - auditory skills
  - monitoring feedback
  - association

- charts
  - learning games
  - models, toys
- vocational
  - pre-vocational

- subject area
  - science, art, gym

- transportation

- home

Material

- curriculum continuum
  - segmented
  - functional interaction

- laboratory
  - experiments
  - trial and error
  - discovery

- puzzle

- didactic

- teacher prepared

- commercial

- human

Students

- progress
  - continuum
  - individual rate
  - enriched
  - normal
  - slow

- motivation
  - self
  - external

- correction

- feedback: self
  - immediate
  - delayed
  - visual
  - auditory
  - kinaesthetic
  - tactile

Family Community

- develop goals
  - general
  - specific

- provide resources
  - human
  - agency
  - financial
  - physical
  - vocational
  - social-psychological
  - medical

- evaluate progress
  - group
  - individual

- develop image
  - individual
  - group

INTERACTION CHART

Material (Contd.)

- physical
  - electrical
  - mechanical
- biological
  - animal
  - vegetable
- chemical
  - geological

Students (Contd.)

- feedback: external
  - immediate
  - delayed
- learning
  - active
  - passive
- evaluation
  - self
  - external
- image
  - self
  - group

Family (Contd.)
Community (Contd.)

- agency
- community
- stimulate progress
  - group
  - individual

Teacher

- teach
  - new concepts
  - drill
  - integrate
  - condition
    - reinforce
- evaluate progress
  - group-periodic
  - individuals-continuing
  - status
  - longitudinal
- select materials
  - group
  - individual
- select method, equipment
  - place
- observe patterns
  - learning
  - maturation
  - socio-psychological
- diagnose
  - learning problems
  - learning assets
  - learning liabilities
- plan
  - curriculum
    - group
    - individual
- group students
  - group goals
  - group
  - individual
- develop objectives
  - general
  - specific
- interact: professional
  - team teaching
  - other disciplines
- interact: home and community

Administrator

(Education)

- direct
  - teacher interaction
  - utilization of space, equipment
  - clinical evaluation
    - interdisciplinary approach
  - guidance and counseling
  - clerical activities
- guide and direct
  - curriculum planning
  - team teaching
  - student grouping
  - student classification
  - clinical teaching
  - diagnostic teaching
  - preparation of materials
  - selection of equipment
- develop and direct research
  - design
    - experimental techniques
    - experimental methods
- evaluate
  - teacher function
  - teacher placement
  - teacher interaction
  - student progress
  - material
  - curriculum
  - objectives
  - methods
  - equipment
- develop
  - evaluative materials
  - evaluative methods
  - clinical evaluation team
- develop system for
  - information retrieval
  - records
  - analysis

Teacher Education

- learning theory
- maturation and development
  - critical stages
- neuro-physiology
- subject matter expertise
  - in several areas
- diagnosis of learning
  - problems
- evaluation of learning
  - progress
- evaluation of materials
  - methods
  - research techniques
- speech pathology
- physiological phonetics
- audiology
- auditory perception
- visual perception
- lipreading and finger-spelling
- linguistics
- communication skills
  - expressive
  - receptive
  - integrative-associative

CHAPTER XI

SYMPOSIUM DISCUSSION SUMMARY

by MARIE FOCHT, *Assistant Editor*
Teacher, Special Education
Lincoln Public Schools
Lincoln, Nebraska

Mrs. Marie Focht received a Bachelor of Science degree in Home Economics from the University of Nebraska, 1939. She was granted a Masters in Education in Educational Psychology from the University of Nebraska in 1964, after receiving special training in the area of Education of the Visually Impaired at the University of Minnesota. She has eleven years of teaching experience, of which ten have been in the Lincoln public schools as teacher of home bound and visually impaired children.

Mrs. Focht served as Project Observer-Evaluator for "A Feasibility Study to Investigate the Instrumentation, Establishment, and Operation of a Learning Laboratory for Hard of Hearing Children," directed by Dr. Robert E. Stepp. In May, 1965, she acted as Project Assistant for the "Symposium on Research and Utilization of Educational Media for Teaching the Hearing Impaired."

SYMPOSIUM DISCUSSION SUMMARY

Introduction

The participants attending the Symposium were assigned to discussion groups according to a plan to make each group representative of the population. Each group had a pre-selected leader and recorder. From notes taken at these sessions, participants' comment sheets, and the final discussion report presented by each recorder, this summary was compiled.

Summary

The discussions following the presentation of each paper or demonstration evoked many interesting comments and constructive suggestions. A summary of pertinent points discussed by the participants and resource persons in the discussion sessions follows, listed under the name of the resource person to facilitate easy referral.

Robert Heinich

At the outset of the conference, it was brought out by Dr. Heinich that planning must take place at an earlier stage if the systems approach is to be effective. This is due to the changing nature of media which were formerly considered aids to instruction but are now an integral part of the curriculum planning. The various media are no longer supplementary but are now incorporated as vital components of the basic instructional program. Thus the role of the teacher is changing. The classroom teacher is no longer the focal point of change in curriculum strategy. Since technology makes instruction visible, and the teacher can see her errors readily, she may develop feelings of inadequacy. The term "mediated" teacher was introduced, meaning a teacher whose instruction is in "mediated" form, such as a TV teacher.

It was pointed out that research is mainly in media and materials production, but very little is being done on actual classroom instruction. Getting new information into the classroom is most difficult and is a tremendous task since technology has advanced so rapidly in the last few years. This feedback is essential, and one way to get it is through conferences. One criticism of schools of education is that they are organized around the classroom teacher when they should be more concerned about the output of the system (students) than one of the elements (teachers). The fear was expressed that technology would dehumanize the classroom, but the answer was given by Dr. Heinich that it humanizes it by bringing the best brains into the classroom. It was suggested that we underestimate the amount of technology children can absorb.

Alice A. Kent

A demonstration of the overhead projector in classroom use when teaching various subjects elicited much interest and many questions. The thought was expressed that the overhead projector is causing a revolution in methods equal to the invention of the blackboard. Its use can be started at the pre-school level and continue all the way through the child's school career. It is possible to show the deaf child many things which were difficult before the advent of the overhead.

The re-education of teachers in use of overhead projection is very necessary if we are to revise teachers' attitudes. Teachers cannot be expected to use this technique until they have been exposed to the possibilities and until equipment and material are readily available. Teachers' workshops are valuable for stimulating ideas.

Miss Kent starts her teachers by taking over a class and demonstrating procedures in use of the projector. She encourages teachers to talk less and children to talk more. While the demonstrations take a great deal of time, she feels they also save time by leading to much better pre-class preparation. Her teachers now use the overhead a good part of the day, almost eliminating the use of the chalkboard. There appears to be no loss of interest as there has been no decrease of attention apparent after two years of use of the overhead.

A few of the benefits resulting from the use of the overhead projector are as follows:

1. Group teaching is improved.
2. Children can watch as materials are prepared.
3. Attention is better than with charts or cards.
4. Writing by teachers and children improves.
5. Deaf children can be trained in the graphic arts to produce their own materials.

6. Teacher can cover portions and direct attention where desired.
7. Material can be filed and brought back later for review.
8. Maps make geography vocabulary easy to teach.
9. Graph reading is more easily taught.
10. Children's errors can be corrected immediately.
11. Creativity of students is stimulated.
12. Conceptual ability and reasoning are developed.
13. Visual-perceptual problems, such as reversals, become apparent.
14. Continuing eye-to-eye contact between teacher and child is possible.

There seemed to be general agreement that teacher-created materials are usually preferable but some purchased materials are good. Miss Kent suggested the use of packages of materials which are a combination of commercial and teacher-prepared transparencies. Her teachers have their own file of materials and also a centralized filing system. In her school washed x-ray film has proved practical and is available for two cents a sheet. Many types of wax pencils have been used, and felt tip pens are now proving very satisfactory. They have one projector with acetate rolls.

It is important to know what transparencies are available. The U. S. Office of Education has many teacher-made transparencies on file. These will be selected and catalogued if funded. Transparencies can be prepared on translucent paper with black ink to disseminate to all teachers at a cost less than three cents per sheet. Also, the University of Nebraska will reproduce master transparencies sent in by teachers for general distribution. Miss Kent recommended the use of illustrators rather than artists to prepare materials.

The teacher must learn to select between various media to determine which will teach a particular lesson best. It was suggested that schools for the deaf should have an expert on use of the overhead as there is much material available which is not being utilized. This person could be skilled in making transparencies; however, the consensus of opinion seemed to be that teacher-created transparencies made spontaneously during discussions are usually more effective.

A welcome by-product of the use of the overhead projector is the stimulation of interest within parents' groups. Deaf parents can now become involved in the sessions and are more willing to attend.

Louis Forsdale

Discussing the possibilities in the emerging role of 8mm films in education, Dr. Forsdale suggested that the development of 8mm films is increasing accessibility of information in a manner comparable to Gutenberg's invention of printing from movable type. Dr. Forsdale cited simplicity and low cost as definite assets. A 4-minute silent black-and-white film can be produced for $5 to $7 under government-sponsored projects, which would cost $10 to $12 if commercially made.

Listed are advantages in use of 8mm film as mentioned in the discussion groups:

1. Film can be made easily accessible to classroom teachers.
2. All 16mm film can be put into 8mm and used in cartridge loading machines.
3. Cartridges can be easily handled by children.
4. It is especially good for lessons based on progression of steps.
5. Film can be stopped at any point for further study.

6. Endless repetition is possible.
7. It can be used in privacy of booth and child need not display lack of understanding to other students.
8. Immediate reinforcement of correct response or instant correction of wrong response occurs.
9. Answers can be recorded for check on learner response.
10. Writing can be taught by film.
11. There is excellent interaction between machine and student.
12. It provides an interesting way for children to "play with" language.
13. These films are a source of stimulation and motivation.
14. Films provide released time for teachers.

We are on the threshold of discovery of exciting production techniques and of many new uses for 8mm film. Much testing and research needs to be done. It is very desirable to disseminate information concerning this evolving media, as 8mm films seem to hold great potential for classroom use in schools for the deaf. A newsletter published by Columbia University, "8mm in Education" is available without charge upon request.

Adrian B. Sanford

Mr. Sanford stated that the mystery of the learning process is possible to study but not to know. We should remember that "groups" don't learn, "individuals" learn. While technology has raced far ahead of previous expectations and will go further than we can imagine, we still need learner and teacher and materials.

Plastic chips of various colors, shapes, and sizes were used in a demonstration showing methods of teaching categorizing, conceptualizing, etc. Touch is an important part of the learning process. The question was asked if the categorization lesson carried over to other areas of learning. Mr. Sanford answered that the evidence shows transfer to mathematics, but it is still not known exactly what abilities can be attributed to early training in categorization. An interesting point made was that today there is evidence that infants are able to categorize.

Tests we now have fall short in analyzing actual educational development of children. Our means of evaluating learning are crude indeed. With this in mind, a thorough study was made of workbooks in current use and a programmed set of self-instructional booklets devised. In presenting this revised workbook type of programmed learning, Mr. Sanford stated that the opportunity to fail privately is one of the most overlooked aspects of education. Also, while repetition of learning is necessary, especially in the education of the deaf, a balance must be found to prevent boredom.

Questioned concerning availability of self-teaching booklets shown, Mr. Sanford said some material is now available, and technological improvements may permit publication of other material in the future. He stated that educational publishers must be cautious in adopting innovations for financial reasons.

Robert Frisina

During the discussion sessions Dr. Frisina continued the consideration of the auditory channel as an instructional subsystem. Too many children are being "lost" because of poor hearing assessment. Dr. Frisina estimated that 35 to 40% of children in organized programs for the deaf have the potential of understanding speech by auditory training alone. Consideration must be given to the ultimate goals for a given hearing impaired individual as determined by an adequate evaluation of his potential at the time the educator finds him.

The most severely impaired deaf children are visually oriented. This results in a suppression of auditory clues that are needed and on which the child relies. It is sometimes desirable to "fade out" the visual aspect and stress the acoustic approach to enable the child to utilize this channel more effectively. Although research indicates that audition may not add to visual communication, this should not be interpreted to mean that the auditory approach should be neglected. We should keep the auditory avenue open even for the profoundly deaf, at least until research indicates no benefit is derived from it. The thought was expressed by one participant that some children with a given audiogram understand auditory stimuli readily, while others with a similar audiogram do not understand. The variation may be due to consistent and early training, proper amplification, and the quality of perception in the individual.

Concern was expressed as to how much of the day amplification should be used for a child. Dr. Frisina said there is not too much information. Priorities vary at any given time in the life of a child. In coupling amplification to the defective mechanism, we should try to achieve maximum results. He suggested looking at the variables of using amplification—parent's attitudes, having usable batteries, etc. Practical problems of maximum utilization and breakdown in individual aids and group devices need to be considered. The frame of reference should be the standard group aid with earphones. As a matter of practical application, Dr. Frisina said he would include amplification in almost every learning situation unless there is a good reason not to include it.

When questioned concerning his definition of communication, Dr. Frisina said he referred to any method of language exchange. He was defining language as a conventionalized system of signs. If the deaf child learns an adequate system of communication that does not involve speech, he is unlikely to develop adequate vocal production. One new approach to the problem of auditory feedback is through the transposed hearing aids which transpose the speech frequencies to lower frequencies, so children with hearing primarily in the low frequencies can receive a better signal. Dr. Frisina pointed out that Pickett's study showed that the hard of hearing do as well as normal hearing persons in recognition of complex sounds out of 500 cps. In some cases of transposing, vowels stay the same, and the transposing is done only with the consonants.

There is a tremendous opportunity to explore the possibility of improving the education of the deaf with various electronic devices. Much research needs to be done in this area which is so very important to the deaf child.

Robert M. Diamond

Dr. Diamond pointed out that students, teachers, and tools are changing. He illustrated his remarks with amusing and informative pictures. In the discussion sessions, he stressed the need for teachers to state their objectives in terms that are measurable, also suggesting that publishers should state what terminal objective is desired and what students need to know before using their material. A combination of curriculum planners and classroom teachers is most important in developing programs for the deaf.

There is a lack of information by teachers, as well as recent college graduates, concerning tools that are available and how to use them. A teacher preparation program should include experience in developing and using multi-media with deaf children. Teachers must be taught to fit the media to the problem. We need to re-evaluate our tools. The simplest tool to do the job should be selected rather than impressive, fancy gadgets.

There was agreement that there are vast implications for teaching the hard of hearing by television. A unique type of production is needed for the hard of hearing. The pacing, content, and format must be different. According to Dr. Diamond, educational television needs a good technical director. It takes one hundred or more man-hours of work to produce a good ½ hour show. A media generalist and a graphic specialist are needed. If specialists are to create materials, then the specialist and classroom teacher must have comparable behavioral objectives, which must be decided upon before materials are developed. Failure to determine objectives results in poor educational television and films.

Dr. Diamond advised that we select the solution to fit the problem, rather than to find a problem that will use a solution we just happen to have handy!

Sam N. Postlethwait

Much interest was evident concerning Dr. Postlethwait's special teaching center for botany students at Purdue University. During the discussion sessions Dr. Postlethwait described how he prepares for the course. He writes out objectives each week and utilizes references, laboratory materials, and scripts of old tapes. It takes three to four hours to prepare each tape. When asked if availability of technology had changed objectives, he replied that it had because it is now possible to do things that could not be done before. Objectives are often re-formulated. He does not teach the textbook, as it will be replaced in a year or two. His aim is tutoring students, not just putting lectures on tape. He is not thinking in terms of recitation, but in terms of learning. Dr. Postlethwait believes we are tradition bound to conventional homework and in a well-programmed course there is no need for homework. Integrating experiences is the most important thing.

Tape directions can be gone over any number of times and students need not reveal the fact that they do not readily understand the material. According to Dr. Postlethwait, one of the reasons for lack of information is that people are afraid to let others know of their ignorance for fear they will be thought stupid. In his course students can proceed at their own pace.

At the beginning of the semester, Dr. Postlethwait sees all students in groups of fifteen and takes pictures so he can recognize them later. The general assembly is not required, and only thirty to forty of the five hundred students came last year. The busy work has been squeezed out of the course, learning has been sequenced, and students spend less time than formerly. This method has resulted in saving money on staff time, equipment, and laboratories (a small laboratory serves five hundred students). Course grades have improved and enrollments are increasing, although the course is not easy. Similar programs are developing in other courses at Purdue.

Considering application of this course to deaf children, it was pointed out that the tape recorder could be amplified, scripts of the tapes could be used, or video tapes could be substituted for audio tapes and augmented by captions. Also, the opportunity to study and handle laboratory materials would be invaluable to deaf students. Reading and studying done in the integrated learning situation as related to experiments and "visuals" is more meaningful. It places the responsibility for learning on the student, and many participants expressed the thought that elementary level is not too early for this system to be effective.

Robert J. Schmitt

Observing a teaching demonstration by Mr. Schmitt using hard of hearing children from Lincoln's Prescott School, the symposium participants expressed much interest. A unit on the supermarket was taught, integrating various types of technological equipment.

Mr. Schmitt pointed out that one particular advantage of remote control of equipment is that the teacher can watch the children's faces and maintain eye-to-eye contact, never breaking communication. She can immediately note fatigue, loss of interest, or developing discipline problems. Remote control speeds up material presentation and allows for semi-automation of material.

In film presentations, a still framing device is vital as films can be stopped and material studied and discussed. Films should be used as a summarizing device and vocabulary should be taught before film is shown. Written feedback is desirable and is possible where desks with arms are supplied. Children can then write on acetate and this can be shown on overhead projector. A carrousel projector is very useful. Overlays in transparencies are good for teaching sequence.

Captions on films require a great deal of research as shown by the fact that some of the participants had difficulty following captions on the film shown. More research is needed concerning eye movements to see how deaf children's eyes react, to determine best placement of captions, and best speed of film. New captioned films should be specifically designed for the deaf as most of the presently available films were designed for hearing persons. Expressed criticisms of some captioned films were that they are too fast, too simple, not clear, and sound track and captions have different vocabulary. It was pointed out that sound track and captions are now being synchronized.

The ideal set of equipment for a classroom, according to Mr. Schmitt, would include:

1. Group aid
2. Carrousel slide projector
3. Chairs with arms so children could write
4. Overhead projector
5. 8mm projector
6. Screen

When the difficulty of obtaining such equipment was mentioned, Mr. John Gough, Director of Captioned Films for the Deaf, suggested that attempts be made to procure equipment through all possible sources, then Captioned Films would try to supply remaining needs.

Mr. Schmitt stated that there is sometimes initial rejection of automation by teachers so must proceed slowly. It may be necessary to change the curriculum for teacher training. You can take an A-V course and be only an equipment operator. It is very important that teachers be shown how to integrate use of technological equipment now available. They must learn to select the equipment necessary to present the material most effectively and need not always use all of the equipment.

As Mr. Schmitt summarized, "With the new media it is possible to literally bombard each child with a multitude of meaningful visual stimuli on the same topic and provide opportunity for appropriate language to be repeated by the children without boredom until it is mastered."

Harriet G. Kopp

Dr. Harriet Kopp concluded the presentations with a talk concerning applications of the systems concept. During the group discussion that followed it was brought out that we are not using to full benefit all the aids that are now available. We must honestly re-appraise what we are doing even though it be a painful process. Evaluation is one of the best kinds of teacher in-service training.

One point discussed at length was the question of a staff for the design and production of educational media. If teachers are to utilize more teaching materials in daily lessons, who is to be responsible for obtaining these materials, creating them, distributing them, cataloging the items, and storing them? Do these materials have to be designed by the teacher? Is the instructional media to be used in teaching selected at the curriculum planning level or at the classroom presentation stage? There was a variety of opinons among the group as to the function of an artist in designing materials and as to the benefit of instructional materials which might be produced and distributed nationally. Some participants wanted to add a production unit to their staffs; others felt that media specialists, not familiar with the problems of the deaf, would be of limited value in developing instructional sequences.

Dr. Kopp stated that curriculum development is a local problem. She said that if teachers are not capable of constructing curriculum, they are not capable of working with it. However, a consultant might be utilized as part of the staff and could have other duties, thus serving a dual function. A national curriculum would probably not be possible or practical, though certain basic requirements should be expected of all students.

In closing, Dr. Kopp pointed out that a student must learn to interpret multisensory stimuli, then as the individual learns to focus his attention selectively and volitionally, learning takes place in an orderly sequence.

Conclusion

Throughout the discussion sessions, there were recurring references to problems common to all instructors of the deaf. These problems might well form the basis for further study and discussion at a future symposium. The following problems were mentioned:

1. Lack of knowledge of the various sources of materials restricts use.
2. A need exists for a satisfactory method of cataloguing available material for more effective use.
3. There is a lack of adequate storage space for the new materials, especially in the older schools.
4. Some way must be found to make materials more easily accessible to teacher and classroom.
5. More information is needed as to cost of equipping a classroom or school with the recommended devices.
6. Realistic objectives must be chosen before curriculum material is developed.
7. Curriculum must be structured by expert teachers of the deaf in cooperation with audiovisual experts.
8. Programming in language is needed at primary and early elementary school level.
9. There is a desperate need for programmers and training centers for programmers.
10. There is a need to develop school personnel to provide technical knowledge of available equipment, material, and instructional programming.
11. A general editing center for particularly effective teacher-designed transparencies is necessary.
12. Teacher training centers must up-date curriculum to give information and training in use of latest technological devices.
13. Methods of integrating new technological devices with traditional material should be developed and taught.
14. Since technology makes instruction visible, teachers must be willing to view their own errors and adapt accordingly.

In summary, the systems concept in education of the deaf was explored in detail and from a variety of viewpoints. Valuable contributions were made by every participant at the Symposium. Their comments and the summaries of the recorders, Dr. John Wiley and Dr. C. Joseph Giangreco, were invaluable in preparation of this summary. As the summation proceeded it became apparent that many unanswered questions exist and much research is needed in the area of education of the deaf. Vital concern for the hearing impaired individual was shown by each participant and indicates a need for frequent conferences in the future to enable concerned educators to keep pace with our rapidly advancing technology.

APPENDIX A

SYMPOSIUM ON RESEARCH AND UTILIZATION OF EDUCATIONAL MEDIA FOR TEACHING THE DEAF

"Systems Approach In Deaf Education"

National Conference Sponsored by the
Department of Educational Administration
University of Nebraska

THE NEBRASKA CENTER FOR CONTINUING EDUCATION
LINCOLN, NEBRASKA

APRIL 4 TO 6, 1966

Support for this Conference has been provided by a grant from
Captioned Films for the Deaf, U. S. Office of Education,
Department of Health, Education and Welfare

PROGRAM

Monday, April 4

3:00-6:00 p.m. Registration, Conference Lobby

3:30-5:00 p.m. Informal Reception, Grand Island Room

6:30 p.m. Banquet, Columbus Room

First General Session

Chairman: Leo Connor, Lexington School for the Deaf

Welcome from the University of Nebraska
Dale K. Hayes, University of Nebraska

Welcome from Captioned Films for the Deaf
John Gough, Captioned Films for the Deaf

An Instructional System

"Application of Systems Concepts to Instruction"

Robert Heinich, University of Southern California

Tuesday, April 5

8:30 a.m. Second General Session, Scottsbluff Room

Chairman: William Jackson, Dallas Pilot Institute for the Deaf

Projected Materials—An Instructional Sub-system

"Synthesizing Language Art Skills With The Overhead Projector"

Alice A. Kent, East Cleveland Classes for Hearing Impaired Children

"8 mm Films"
Louis Forsdale, Columbia University

Coffee, Conference Lobby

Discussion Session

Group A, Hastings Room

Chairman: Dorothy Beal, Omaha Hearing School

Group B, York Room

Chairman: John Nace, The Pennsylvania School for the Deaf

11:00 a.m. Third General Session, Scottsbluff Room

Chairman: Alice Streng, University of Wisconsin

Printed Materials—An Instructional Sub-system

"The Learner and the Printed Page—The Place of Graphics in a Learning System"

Adrian B. Sanford, Educational Development Corporation

12:00 noon Luncheon, Columbus Room

Chairman: Gilbert L. Delgado, Captioned Films for the Deaf

Discussion Session

2:00 p.m. Fourth General Session, Scottsbluff Room

Chairman: Frank Withrow, Illinois School for the Deaf

Electronic Resources—An Instructional Sub-system

"The Auditory Channel in the Education of Deaf Children"

D. Robert Frisina, Gallaudet College

"A Rationale for Decision: Selecting the Right Tool for the Job"

Robert M. Diamond, University of Miami

Coffee, Conference Lobby

Discussion Session

Group A, Hastings Room

Chairman: J. Jay Farman, New York State School for the Deaf

Group B, York Room

Chairman: Jane R. Birch, Western Pennsylvania School for the Deaf

7:00 p.m. Banquet, Black Coach

Fifth General Session

Chairman: Robert E. Stepp, University of Nebraska

Welcome from the Teachers College
Walter K. Beggs, University of Nebraska

Introduction of Speaker
Wesley C. Meierhenry, University of Nebraska

An Instructional System

"A Multi-faceted Approach to Teaching"
Samuel N. Postlethwait, Purdue University

Wednesday, April 6

9:00 a.m.	Sixth General Session, Scottsbluff Room
	Chairman: Marshall Hester, New Mexico Foundation
	Multi-media Approach to Teaching a Unit
	"The Multi-media Approach in the Classroom for the Deaf"
	Robert J. Schmitt, Captioned Films for the Deaf
	Coffee, Conference Lobby
	Discussion Session
	Group A, Hastings Room
	Chairman: Edgar L. Lowell, John Tracy Clinic
	Group B, York Room
	Chairman: Bjorn Karlsen, University of Minnesota
11:45 a.m.	Luncheon, Columbus Room
	Seventh General Session
	Chairman: Ray Jones, San Fernando Valley State College
	An Instructional System
	"Applications of Systems Concept to Teaching the Deaf"
	Harriet Kopp, Detroit Day School for Deaf
	Farewell: John Gough, Captioned Films for the Deaf
	Adjourn

SYMPOSIUM ADVISORY COMMITTEE

Leo P. Connor
John A. Gough
Marshall P. Hester
William D. Jackson
Ray L. Jones
Harriet G. Kopp
Robert J. Schmitt
Frank B. Withrow

CONFERENCE STAFF

C. Joseph Giangreco, Recorder
John Wiley, Recorder
Marie Focht, Project Assistant
Wilbur Wakefield, Conference Coordinator
Marcia Carlson, Symposium Secretary

APPENDIX B

SYMPOSIUM ON RESEARCH AND UTILIZATION OF EDUCATIONAL MEDIA FOR TEACHING THE DEAF

Roster of Conference Participants

Mr. Harlan H. Adams, Consultant
Speech Therapy Services
State Capitol
Lincoln, Nebraska 68509

Mr. Curtis Atkinson
Librarian
Georgia School for the Deaf
Cave Spring, Georgia 30124

Mrs. Dorothy S. Beal, Supervisor
Omaha Hearing School
4410 Dewey Avenue
Omaha, Nebraska 68105

Miss Barbara Beggs
Fairchild Hall
Illinois State University
Normal, Illinois

Dr. Walter K. Beggs, Dean
Teachers College
University of Nebraska
Lincoln, Nebraska

Dr. Thomas Behrens, Director
Kendall School
Gallaudet College
Washington, D. C.

Miss Betty Bennett
Department of Hearing and Speech
University of Kansas Medical Center
Rainbow Blvd. and 39th Street
Kansas City, Kansas

Dr. Elizabeth Benson
Associate Editor
American Annals of the Deaf
Gallaudet College
Washington, D. C.

Mrs. Jane Birch
Western Pennsylvania School for the Deaf
200 Edgewood Avenue
Pittsburgh, Pennsylvania 15218

Mr. Paul C. Bird, Principal
Florida School for the Deaf and Blind
Saint Augustine, Florida

Mr. Bill G. Blevins
Assistant to the President
The Clarke School for the Deaf
Northampton, Massachusetts

Dr. E. B. Boatner, Superintendent
American School for the Deaf
139 North Main Street
West Hartford, Connecticut 06107

Mr. James W. Card, Supervisor
Deaf and Hard of Hearing
270 East State Street
Columbus, Ohio 43215

Miss Josephine Carr
Program Director: The Deaf
Oregon College of Education
Monmouth, Oregon 97361

Dr. Leo E. Connor
Associate Superintendent
Lexington School for the Deaf
904 Lexington Avenue
New York, New York 10021

Mr. Gilbert Delgado
Assistant Director
Captioned Films for the Deaf
U. S. Office of Education
Department of Health, Education and
Welfare
Washington, D. C.

Dr. Robert M. Diamond
Director of Instructional Resources
Office of the Study of Instruction
University College
University of Miami
Coral Gables, Florida

Dr. G. C. Eicholz
Educational Consultant
Systems Consultants, Inc.
P. O. Box 17049
Tampa, Florida 33612

Mrs. Marian Ellerbeck, Teacher
Iowa School for the Deaf
Council Bluffs, Iowa

Mr. J. Jay Farman, Superintendent
New York State School for the Deaf
713 North Madison Street
Rome, New York 13440

Mrs. Marie Focht, Teacher
Special Education
Lincoln Public Schools
Lincoln, Nebraska

Dr. Louis Forsdale, Director
Projects in Educational Communication
Teachers College
Columbia University
New York, New York

Dr. Robert Frisina, Dean
Graduate College
Gallaudet College
Washington, D. C.

Dr. C. Joseph Giangreco
Superintendent
Iowa School for the Deaf
Council Bluffs, Iowa

Mrs. Harriett N. Gough
Gallaudet College
Kendall School
Washington, D. C.

Mr. John A. Gough, Director
Captioned Films for the Deaf
Office of Education
Department of Health, Education, and Welfare
Washington, D. C.

Dr. Lloyd Graunke, Superintendent
Tennessee School for the Deaf
P. O. Box 886
Knoxville, Tennessee 37901

Mr. Claude S. Gulbranson
Principal
Virginia School for the Deaf
Staunton, Virginia 24401

Mr. Kendall Hanks
New Mexico Foundation
Box 155
University Park, New Mexico

Miss Norma Hansen, Coordinator
Speech Therapy
Lincoln Public Schools
Lincoln, Nebraska

Mr. Gordon Harland, Principal
Arizona State School for the Deaf and Blind
P. O. Box 5545
Tucson, Arizona 85703

Dr. Dale K. Hayes, Chairman
Department of Educational Administration
University of Nebraska
Lincoln, Nebraska

Dr. Robert Heinich, Director
Instructional Technology Department
School of Education
Annex 101, E.M.S. In.
University of Southern California
Los Angeles, California

Dr. Marshall P. Hester
Project Director
New Mexico Foundation
Box 155
University Park, New Mexico

Mrs. Dorothea Heuser, Teacher
Prescott Hard of Hearing Unit
Lincoln Public Schools
Lincoln, Nebraska

Mr. Doin Hicks
665 Lindell
Fayetteville, Arkansas

Mr. Tom J. Hicks, Principal
Arkansas School for the Deaf
Little Rock, Arkansas 72205

Mrs. Marcia Hollestelle, Teacher
Prescott Hard of Hearing Unit
Lincoln Public Schools
Lincoln, Nebraska

Mr. James A. Hoxie
Assistant Superintendent for Instruction
California School for the Deaf
3044 Horace Street
Riverside, California

Mr. Julius Humann, Director
Special Education and Guidance
Lincoln Public Schools
Lincoln, Nebraska

Mrs. Ferne Ihfe, Teacher
Prescott Hard of Hearing Unit
Lincoln Public Schools
Lincoln, Nebraska

Mr. William D. Jackson
Pilot School for the Deaf
4909 Cedar Springs
Dallas, Texas 75235

Mrs. Opal Jennings, Teacher
Iowa School for the Deaf
Council Bluffs, Iowa

Dr. Ray Jones, Project Director
Leadership Training in the Area of the Deaf
San Fernando Valley State College
Northridge, California 91326

Dr. Bjorn Karlsen
Associate Professor
Special Education
University of Minnesota
Minneapolis, Minnesota 55455

Miss Elizabeth Kelly
Montrose Elementary School
4011 Stanford
Houston, Texas

Miss Alice Kent, Supervisor
Classes for Hearing Impaired Children
East Cleveland City Schools
14121 Shaw Avenue
Cleveland, Ohio

Dr. Harriet G. Kopp, Principal
Detroit Day School for the Deaf
6045 Stanton
Detroit, Michigan

Mrs. Emmylou Krohn, Teacher
Iowa School for the Deaf
Council Bluffs, Iowa

Mr. Alfred J. Lamb
Assistant Superintendent
Indiana School for the Deaf
1200 East 42nd Street
Indianapolis, Indiana 46205

Mr. Myron A. Leenhouts
Assistant Superintendent for Instruction
California School for the Deaf
2601 Warring Street
Berkeley, California 94704

Mr. Robert K. Lennan
Coordinator of Field Services
Leadership Training in the Area
of the Deaf
School of Education
San Fernando Valley State College
Northridge, California 91326

Dr. Edgar L. Lowell
Administrator
John Tracy Clinic
806 West Adams Boulevard
Los Angeles, California 90007

Mr. Floyd McDowell
Superintendent
Montana School for Deaf and Blind
Great Falls, Montana

Mr. James McLean, Research Coordinator
Handicapped Children and Youth Branch
Division of Elementary and Secondary
Research
Department of Health, Education,
and Welfare
Washington, D. C. 20202

Dr. Wesley C. Meierhenry,
Assistant Dean
Teachers College
University of Nebraska
Lincoln, Nebraska

Dr. William E. Miller
Acting Head, Department of Logopedics
Wichita State University
2400 Jardine Drive
Wichita, Kansas 67219

Mrs. Mary Moffit, Teacher
Prescott Hard of Hearing Unit
Lincoln Public Schools
Lincoln, Nebraska

Mrs. Allice Munnis
Assistant Principal
Prescott School
Lincoln Public Schools
Lincoln, Nebraska

Dr. Joseph Murnin
Media Program
Office of Education
Department of Health, Education,
and Welfare
Washington, D. C. 20202

Mr. John G. Nace, Headmaster
The Pennsylvania School for the Deaf
7500 Germantown Avenue
Philadelphia, Pennsylvania 19119

Dr. Sam N. Postlethwait, Professor
Department of Biological Sciences
Purdue University
Lafayette, Indiana 47907

Mr. Frank Powell
North Carolina School for the Deaf
Morganton, North Carolina 28655

Mrs. Helen Purdy, Teacher
Iowa School for the Deaf
Council Bluffs, Iowa

Dr. Howard M. Quigley, Superintendent
Minnesota School for the Deaf
Faribault, Minnesota 55021

Mr. Donald Ravell, Principal
Agassiz Elementary School
510 West 38th Street
Minneapolis 9, Minnesota

Mr. Adrian B. Sanford, President
Educational Development Corp.
200 California Avenue
Palo Alto, California

Mr. Robert Schmitt
Educational Media Specialist
Captioned Films for the Deaf
Arkansas State School for the Deaf
Little Rock, Arkansas

Dr. S. Richard Silverman, Director
Central Institute for the Deaf
818 South Euclid
St. Louis, Missouri 63110

Sister Marie Suzanne, C.S.J.
St. Joseph Institute for the Deaf
1483 Eighty-second Boulevard
St. Louis, Missouri 63132

Sister Mary Laurentine C.S.J.
St. Joseph Institute for the Deaf
1483 Eighty-second Boulevard
St. Louis, Missouri 63132

Professor Alice Streng
Education of the Deaf
University of Wisconsin
Milwaukee, Wisconsin 53211

Mrs. Helen Tinley, Teacher
Iowa School for the Deaf
Council Bluffs, Iowa

Miss Viola Thoms, Teacher
Iowa School for the Deaf
Council Bluffs, Iowa

Dr. John Wiley
Speech Clinic
Institute for Human Adjustment
1111 East Catherine Street
University of Michigan
Ann Arbor, Michigan

Dr. Frank B. Withrow
Director of Research and Clinical Services
Illinois School for the Deaf
Jacksonville, Illinois 62650

Dr. Ray Wyman
Department of Audiovisual Instruction
University of Massachusetts
Amherst, Massachusetts

LIBRARY SURVEY PROJECT

A two year Survey of the Status of School Library Services in Schools for the Deaf in the United States was completed in June, 1966. This survey was conducted by Mrs. Patricia Blair Cory for the Convention of American Instructors of the Deaf and was made possible by a contract from the Office of Captioned Films for the Deaf.

Thirty schools for the deaf were visited by the Project staff. Since a sample of 30 schools represents a third of the total population of 100, valid results could be obtained. The schools visited represented the following categories, regions and populations.

By Type	
Public Residential	17
Private Residential	5
Public Day	8
	30

By Region	
Far West	3
Middle West	9
South East	3
North East	15
	30

By Student Population	
Under 250	15
Over 250	15
	30

Mrs. Cory, who was on partial leave from her post as Director of Library Services and Visual Education at the Lexington School for the Deaf, visited 26 of the 30 schools in the sample. Dr. Joseph Rosenstein, Director of Lexington's Research Department visited the remaining four schools all situated in the West.

Every effort was made to observe the same kinds of things at each school. To ensure this and to achieve as much objectivity as possible, interview sheets and checklists were prepared for use during each onsite visit to the 30 schools. The interview sheet included items pertaining to library quarters and equipment, library program, and personnel. The checklist pertained to the library book collections for quality and for current and up-to-date materials. Every effort was also made to secure the amount of expenditures for books, periodicals, and visual materials from each school.

Beyond the factual and objective information, the interviewer necessarily depended on personal professional judgement regarding what he observed. The Project director and the two school library specialist consultants[1] evaluated the descriptions of library services in each school against their years of experience in librarianship, and in the Project Director's case against her experience in the education of the deaf.

In addition the findings were measured against *Standards for School Library Programs*[2] which were adopted by the American Library Association and a number of other interested professional associations in 1960. Although the 1960 Standards are now considered out of date for good schools for the hearing due to rising prices and increased demands from modern curriculums, none of the schools for the deaf in the sample met the 1960 Standards in every area. One school qualified in all but quarters where it fell far below in floor space and seating capacity. A few schools came close to meeting the lower ranges of the Standards. Ten schools had professionally trained personnel consistently offering enough in the way of services and program to form a cluster of ten at the top that might be called "superior" in library services. Superior, that is, in relation to what was being provided in the other 20 schools in the sample.

In general, in the major areas of school library service which were surveyed, Personnel, Library Quarters and Equipment, Expenditures, Collections, and Library Program, every school should improve in some areas and the majority of the schools fell seriously below the 1960 Standards in every area both in quality and quantity.

Personnel

Only 18 of the schools had a staff member assigned to the library, two of these had two librarians each making a total of 20 persons. Two had no professional training of any kind. Of the 18 who had professional training not all were functioning as effectively as the administrations deemed desirable.

The 18 trained persons assigned to libraries at the time of the survey had a variety of backgrounds. Eleven were graduates of a graduate library school or an undergraduate Department of Library Science. Four of the eleven are deaf and are graduates of the Library Science Department at Gallaudet College. Nine were trained teachers of the deaf. Five had some training in both the fields of librarianship and education of the deaf. For example, one had the Master of Library Science degree plus 27 hours in Special Education. One had training and experience in visual education in addition to the Library Science degree and 12 hours in education of the deaf.

The quantity of personnel assigned in most of the schools fell far short of recommended Standards. Sixteen of the 18 schools reported a staff of one and the one was not always full time. The contribution which one librarian can make in a school of over 500, for example, spread over a large campus with students present both evenings and week-ends is minimal.

Only two schools reported that they had two professional librarians and both of these schools also reported the supporting help of a secretarial assistant in the library. However, in these schools the libraries embraced every range of educational material including audio and visual as well as printed so that the staffs carried just as heavy a work load as those in the one-man libraries.

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[1] Dr. Frances Henne, Professor of Library Service, Columbia University
Miss Mae Graham, State School Library Supervisor, Maryland State Department of Education

[2] Published by the American Library Association. Chicago. 1960.

Twelve schools[3] had no librarians the year the survey was made.

The majority of the schools without library staff were public day schools. Five of the eight in the sample had no librarian and consequently the faculty and students in those schools were deprived of rich sources of supplementary educational and recreational materials.

Two private residential schools had no librarians.[4] Efforts are made in both these schools to compensate. Supervisory teachers purchase and promote the use of library books as time permits, or class visits are arranged to nearby public libraries.

In general, schools without librarians or with untrained librarians depended heavily on textbooks and lacked the variety of rich resources that should be available to every student.

In general, the schools with librarians (with but one or two exceptions) were providing supplementary reference, study, and recreational materials to the degree budgets permitted, and the library programs of services were being enthusiastically carried on within the limits attainable because of staff shortage.

Library Quarters and Equipment

Three newly remodeled libraries, two libraries situated in new buildings and one housed in a separate building were attractive and met or exceeded standards for floor space and seating capacity.[5]

With the exception of the six described above all the school's libraries were crowded and in need of additional floor and shelving space as well as greater seating capacities. The public residential schools were providing better library quarters than the schools in other categories. The public day schools were operating with the least desirable conditions. One was using a few feet in the corner of the printing shop and had seats for two. Another was in a windowless, unlighted area at the dead end of a second floor corridor and had zero seating capacity. A third public day school was using space under a stairwell to house a small library book collection and also had zero seating capacity.

As for equipment, only one school in the entire sample reported any sizeable amount of equipment for educational purposes and two libraries in the sample did not even have their own typewriters.

Expenditures

Among the 30 schools, only seven were meeting minimal Standards[6] and of these seven, only two, both public residential schools, exceed the Standards.

Expenditures in the past have been so low, and the collections of books and other materials so small, that expenditures should be increased drastically to bring the collections of materials up to sizes where they can offer variety of choice and stimulation to deaf students.

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[3] Two of the residential schools have since hired trained librarians.

[4] One school has a person whose title is librarian but he has a full time class load.

[5] 30–35 square feet per reader, 45–55 seating capacity for schools having 200–500 students.

[6] $1,000 to $1,500 for schools having 200–249 students, $4 to $6 per student for schools having 250 or more students.

Collections

The majority of the library book collections were small in relation to Standards. Two of the schools had no library book collections, two could not estimate the size of their collections, and 19 fell below the lower range of the recommended size. Seven schools met the quantitative standards. Of these seven, only two schools exceeded the upper range, four slightly exceeded the lower range, and one barely met the lower range.

The meagerness of the books available to deaf students is clearly a disadvantage for them and the collections should be expanded.

Quality can also be improved and new and up-to-date materials are needed almost everywhere especially in the areas of science and reference books.

The motion picture and filmstrip collections in the public residential schools are excellent in quantity and quality as a result of the very fine Captioned Films Program. The private residential and public day schools did not have deposits of educational Captioned Films at the time of the survey.

Library Programs

The schools without librarians obviously had no program of activities and the schools with part time or untrained staff were operating on minimal bases much as old fashioned study halls.

A cluster of ten schools (9 public residential and 1 public day school) consistently at the top in every area reported providing the most library services and activities for students and faculty. They give individual reference service and reading guidance, do story telling, give instruction in the use of the library and reference books, use all types of materials in their programs. Many of them also provide displays and bibliographies, plan field trips to community libraries, work with teachers to acquaint them with visual materials as well as books, and serve the student teacher's needs.

All these services are possible because the library staffs at the ten top schools have an understanding of the purposes and goals of library service, have knowledge of the needs of deaf students and the problems and opportunities in the education of the deaf. They are energetic and dedicated people working at top capacity.

As Phase I of the Library Project ends thanks are due to the eight members of the Advisory Council and to the two Library Consultants:

Mr. Lloyd A. Ambrosen, Superintendent
Maryland School for the Deaf
President, The Convention of the American Instructors of the Deaf, 1963–1965

Mrs. Betty Bollback Evans, Educational Consultant
Pennsylvania School for the Deaf

Dr. William J. McClure, Superintendent
Indiana School for the Deaf

Miss Marjorie E. Magner
Supervising Teacher, Lower School
The Clarke School for the Deaf

Mrs. Lucille Pendell, Librarian
Gallaudet College

Dr. Stanley D. Roth, Superintendent
Kansas School for the Deaf
(Dr. Roth joined the Council when he assumed the Presidency of CAID in July 1965.)

Mr. Ben M. Schowe, Jr., Librarian
Ohio School for the Deaf

Dr. Roy Moore Stelle, Superintendent
New York School for the Deaf

Dr. Frances Henne
Professor of Library Service
Columbia University

Miss Mae Graham
School Library Supervisor
Maryland State Department of Education

The Future

The survey clearly indicates the need for improvement in library services in schools for the deaf. With today's changing curriculum making new demands on libraries for all types of materials, and with the explosion of new materials and new devices becoming available both commercially and through the excellent Captioned Films Program, the time is propitious for improvement and expansion of libraries and/or Instructional Materials Centers in schools for the deaf.

The Captioned Films office has funded a second project for one year to permit further study of the recommendations for standards by a second group of outstanding leaders in education of the deaf. The second Advisory Council met in New York, November 14th and 15th and discussed the recommendations which grew out of the Status Survey.

They will continue to study and revise, independently and by correspondence, throughout the winter of 1966–67. A second meeting will then be held in the spring of 1967 for formulation of actual Standards for School Library Programs in schools for the deaf. These Standards will be presented to the Convention of American Instructors of the Deaf at the 1967 Conference and to other appropriate and interested associations such as A. G. Bell, CEC, the American Association of School Librarians of the ALA, and the Division of Audiovisual Instruction of the NEA. The Project staff will keep close contact during the year with Dr. Frances Henne, Chairman of the Committee appointed to revise upward the 1960 ALA Standards. Standards developed for the field of the deaf will not fall below those developed for hearing students, and may exceed them to provide for the special needs of deaf students.

It is the hope of the many educators involved with the Library Project that the Standards developed can be implemented without undue delay thus raising levels of instruction and opportunity for deaf students everywhere.

*ERIC

EDUCATIONAL RESEARCH INFORMATION CENTER

A national information system dedicated to the progress of education through the dissemination of educational research results and research-related materials.

Research Information Needs in Education

Educational research is a basic part of President Johnson's ". . . first work of these times." Since 1956, when the funding of the Cooperative Research Program began, the Office of Education has administered increasingly broadened research programs based on legislation enacted by Congress. Through this and other research, questions which have perplexed educators for years are being answered at an increasingly rapid rate. Information about educational organization, curriculum, methods, and materials has little value, however, unless it is made known to persons who can use it—teachers, administrators, and researchers. Recognizing that sponsoring research on educational problems is only half the job, the Office of Education has assumed responsibility for transmitting the findings to educators and administrators. To achieve this objective, the Office has developed the Educational Research Information Center—ERIC.

What ERIC Is

ERIC is the first nationwide, comprehensive information system designed to serve American education. Operating within the Office of Education as a Branch of the Division of Research Training and Dissemination, Bureau of Research, the headquarters office is referred to as Central ERIC to distinguish it from its components in the field. In addition to the overall development, coordination of field activities, and operation of the system, Central ERIC is responsible for making available to the public the findings of research supported by the Office of Education through the Bureau of Research. ERIC also currently includes 12 decentralized clearinghouses, each focused on a separate subject-matter area, and several contractors who provide specialized services. Normally, when used by itself and in this article, the term ERIC refers to the system as a whole.

Uses of ERIC

The basic objective of ERIC is to provide information on reliable, current educational research and research-related materials inexpensively to a wide variety of audiences: teachers, administrators, other education specialists, researchers, public officials, commercial and industrial organ-

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* Reprinted from U. S. Office of Education, document OE-12022-66.

Valuable research has often remained dormant because of lack of information and a means of dissemination. ERIC can be an important service to researchers, administrators and teachers in the education of the deaf. Your attention is called to this service and especially to the last paragraph.

izations, and the public. The ultimate value of ERIC's services will be measured by the degree to which persons anywhere in the country can rely upon ERIC to inform them of the most important developments in any area of specialization in education, regardless of the place where the new developments occurred.

How ERIC Operates

Through leadership and coordination provided by Central ERIC and with the cooperation of persons at the affiliated clearinghouses, ERIC acquires, abstracts, indexes, stores, retrieves, and disseminates nationally the most significant and timely educational research and research-related documents. Aside from the reports included by Central ERIC—those based on research projects supported by the Office of Education—selection of documents to be included in the ERIC collection is made by subject-matter specialists at the decentralized clearinghouses. Such a decentralized system was developed because it was felt that persons knowledgeable in a given substantive area of educational research were better able to decide what information is of sufficient value to be disseminated through ERIC.

Once the professional staff at a clearinghouse decides that a document has enough quality and significance to be made available to others, this document is cataloged, abstracted, and indexed at the clearinghouse according to principles developed under the direction of Central ERIC. Each clearinghouse uniformly records the document citation, abstract, and index terms on a standard ERIC resume form via a paper-tape typewriter. The resume forms, punch-paper tapes, and documents are sent to Central ERIC, where they become the principal vehicles for storage, retrieval, and dissemination.

The key to efficient storage and retrieval is a well-developed subject vocabulary. ERIC therefore has organized the Panel on Educational Terminology, which is working with the clearinghouses to develop a thesaurus of educational terms. Use of compatible terminology by the clearinghouses permits the inputs from the various clearinghouses to be merged into a large storage and retrieval facility capable of answering general inquiries.[1]

Documents forwarded to Central ERIC from the clearinghouses and the research reports from the Office of Education processed by Central ERIC will be disseminated to the public. Each document will be given an ERIC document (ED) number and be listed, along with its citation and abstract, in an announcement publication.

Monthly Publication on Research

Present plans call for a monthly publication with detailed indexes of all new acquisitions to the ERIC collection. Central ERIC will inform educators and research specialists of the availability of this publication.

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[1] As the collection of ERIC materials grows, Central ERIC will be able to answer inquiries for information about research on various problems or topics. Also, the computer tapes containing the full record of all current ERIC documents will be made available to organizations who may want to develop their own search and retrieval capabilities. Until there has been a public announcement to that effect, however, ERIC will not be able to engage in search operations.

ERIC Collection

As of July 1, 1966, the ERIC collection contained slightly over 1,700 documents distributed as support material for developing programs for the educationally disadvantaged. Two indexes (**Catalog of Selected Documents on the Disadvantaged: a Number and Author Index**–OE–37001–and a **Subject Index**–OE–37002) describing these documents have been prepared and are available through the U. S. Government Printing Office, Washington, D.C. 20402.

By October 1966 the collection will include special materials on higher education and the full text of all final reports submitted to the Office of Education under the Cooperative Research Program, the Adult and Vocational Research Program, Handicapped Children and Youth Research Program, and the Modern Language and New Media Research Programs (Titles VI and VII of the National Defense Education Act of 1958). In addition, the substantive parts of many of the projects supported under Titles I, III, anl V (Section 505) of the Elementary and Secondary Education Act of 1965 will be included in ERIC.

By fall 1966 documents from the 12 ERIC clearinghouses that were established in June 1966 will also be added to the collection.

ERIC Document Reproduction Service

In addition to the abstracts contained in the monthly publications, many readers will want the full texts of documents. The Office of Education has therefore established the ERIC Document Reproduction Service through which any document cited as available can be obtained at nominal cost on microfiche or hard copy.[2]

ERIC's Relation to Other Dissemination Programs

ERIC is naturally not, nor will it be, the only source of information about educational research. It will, however, provide services that do not now exist. By doing its job well, ERIC will contribute directly to the development and strengthening of other dissemination programs that begin where ERIC leaves off. For instance, state or city school systems, colleges and universities, or professional organizations may use ERIC to sharpen or expand their own dissemination programs. By relying on ERIC to inform them of research developments in education, organizations can develop the necessary means—through publications, video tape, and live demonstrations, for example—to introduce the results of research into classrooms, campuses, and laboratories of America. By providing a systematic and comprehensive link between researchers and the many potential users of research findings, particularly teachers and administrators, ERIC can effectively contribute to speedy and widespread implementation of promising research leads.

How To Assist ERIC

The ERIC system depends upon the acquisition of significant documents by the clearinghouses. Researchers and others can assist the clearinghouses in their search for quality documents in two ways: (1) by keeping the director of any clearinghouse informed of any new projects or programs that relate to a particular area of research and development activity, and (2) by sending two copies of every report, reprint, or other document to the director of the clearinghouse who would be most interested in reviewing the document for inclusion in the ERIC collection.

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[2] The ERIC Document Reproduction Service is operated under an Office of Education contract with Micro Photo Division, Bell & Howell Company, 1700 Shaw Avenue, Cleveland, Ohio 44112. Orders for documents, by ERIC document number, should be addressed to Bell & Howell Company. They generally are filled within 5 days after receipt of request.

If an organization wishes to affiliate with ERIC on a cooperative basis —to exchange documents, for instance, without receiving any financial assistance—interest may be expressed at any time to the Director of ERIC, U. S. Office of Education, Washington, D. C. 20202.

Current ERIC Clearinghouses

To date ERIC has established 12 external clearinghouses, as listed below. The name of the director of each clearinghouse is given, and the topical or subject-matter area of each is reflected in the title of the clearinghouse. Additional information about the scope of any clearinghouse can be obtained by writing to the director of that clearinghouse or to Central ERIC.

As funds permit, additional clearinghouses will be established on priority topics or subject-matter areas identified by consultants to the Office of Education, educational organizations, and staff of the Office. At least once a year, an invitation will be issued for submitting proposals for establishing clearinghouses on announced topics. Unsolicited proposals will not be considered.

Dr. Arthur M. Cohen
ERIC Clearinghouse on *Junior Colleges*
University of California at Los Angeles
405 Hilgard Avenue
Los Angeles, California 90024

Dr. June B. Jordan
ERIC Clearinghouse on *Exceptional Children*
Council for Exceptional Children
National Educational Association
1201 Sixteenth Street, N.W.
Washington, D.C. 20036

Dr. A. Hood Roberts
ERIC Clearinghouse on *Linguistics* and the Uncommonly Taught Languages
Center for Applied Linguistics
1755 Massachusetts Avenue, N.W.
Washington, D.C. 20036

Dr. Edward G. Summers
ERIC Clearinghouse on *Reading*
204 Pine Hall
Indiana University
Bloomington, Indiana 47401

Dr. Garry Walz
ERIC Clearinghouse on *Counseling and Guidance*
University of Michigan
Ann Arbor, Michigan 48104

Dr. John S. Richardson
ERIC Clearinghouse on *Science Education*
Ohio State University
1314 Kinnear Road
Columbus, Ohio 43212

Dr. Darrell S. Willey
ERIC Clearinghouse on *Small Schools* and Rural Compensatory Education
New Mexico State University
University Park, New Mexico 88070

Dr. Edmund W. Gordon
ERIC Clearinghouse on the *Disadvantaged*
Yeshiva University
55 Fifth Avenue
New York, New York 10003

Dr. Kenneth Mildenberger
ERIC Clearinghouse on the Teaching of *Foreign Languages*
Modern Language Association of America
4 Washington Place
New York, New York 10003

Dr. Leonard J. West
ERIC Clearinghouse on *School Personnel*
City University of New York
33 West 42d Street
New York, New York 10036

Dr. Robert E. Taylor
ERIC Clearinghouse on *Vocational and Technical Education*
Ohio State University
980 Kinnear Road
Columbus, Ohio 43212

Mrs. Ione F. Pierron
ERIC Clearinghouse on *Educational Administration*
University of Oregon
Eugene, Oregon 97403